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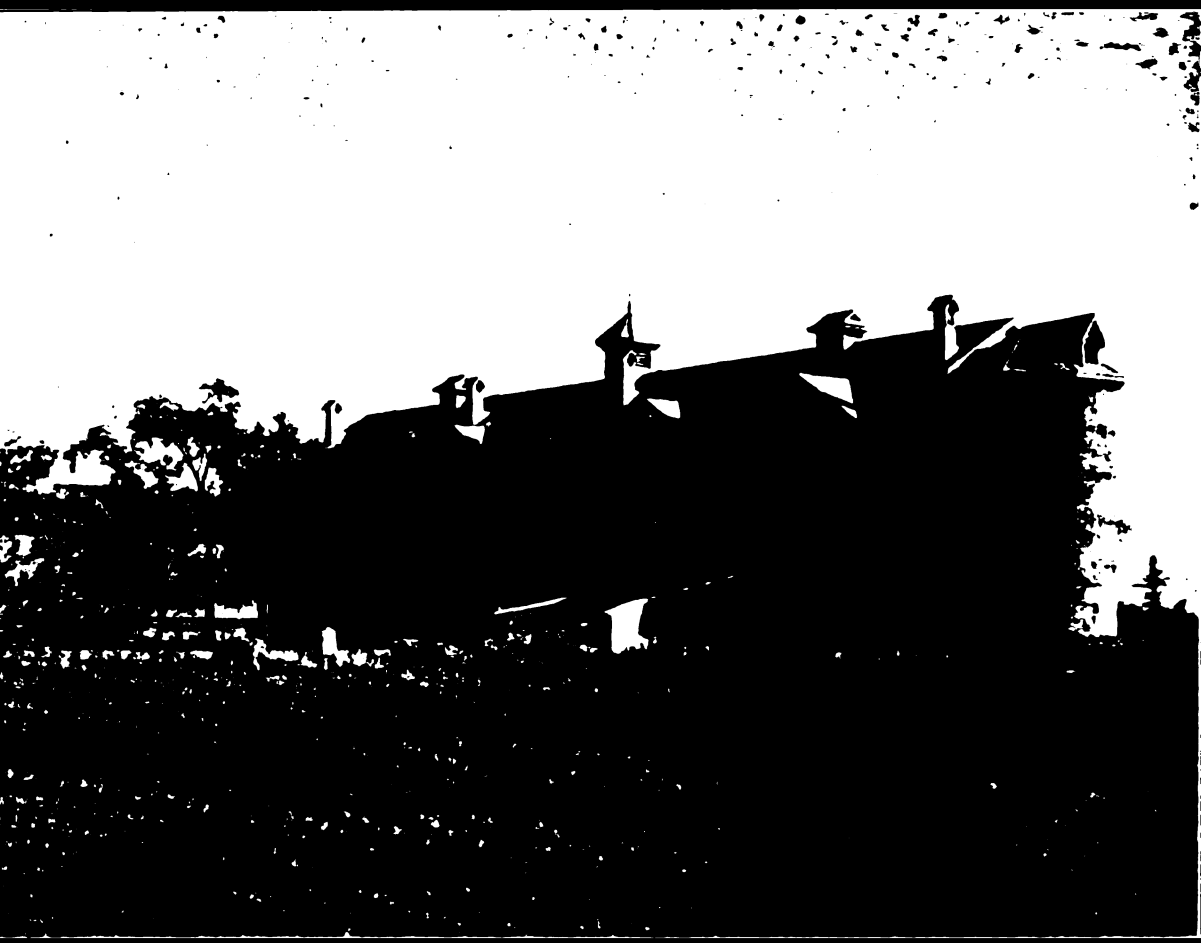

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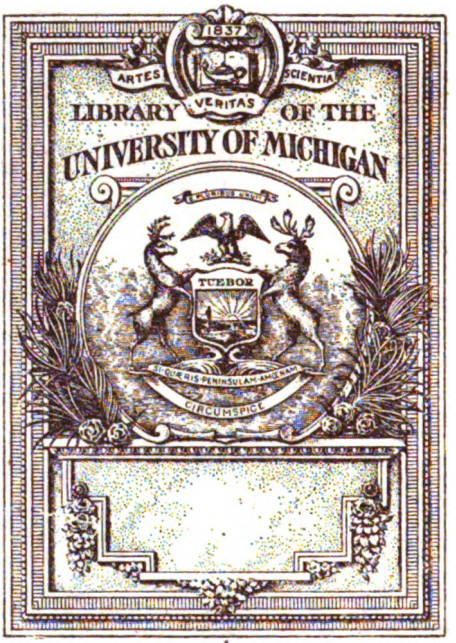

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SESSIONAL PAPERS

VOL. XLVI.—PART IX.

THIRD SESSION

OF THE

THIRTEENTH LEGISLATURE

OF THE

PROVINCE OF ONTARIO

SESSION 1914

TORONTO:
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No. 2 — Estimates—Supplementary, for the service of the Province for the year ending 31st October, 1913-14. Presented to the Legislature, 27th February and 9th April, 1914. *Printed.* Estimates for the year ending 31st October, 1915. Presented to the Legislature, April 21st, 1914. *Printed.*

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No. 5 — Report of the Inspector of Division Courts for the year 1913. Presented to the Legislature, March 11th, 1914. *Printed.*

No. 6 — Report of the Inspector of Legal Offices for the year 1913. Presented to the Legislature, April 1st, 1914. *Printed.*

No. 7 — Report of the Inspector of Registry Offices for the year 1913. Presented to the Legislature, April 17th, 1914. *Printed.*

No. 8 — Report of the Provincial Municipal Auditor for the year 1913. Presented to the Legislature, April 16th, 1914. *Printed.*

No. 9 — Report of the Commissioners for the Queen Victoria Niagara Falls Park for the year 1913. Presented to the Legislature, April 15th, 1914. *Printed.*

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No. 11 — Report of the Registrar of Friendly Societies for the year 1914. Presented to the Legislature, March 20th, 1914. *Printed.*

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No. 18 Report of the University of Toronto Board of Governors for the year ending 30th June, 1913. Presented to the Legislature, March 18th, 1914. *Printed.*

No. 19 Report of the Secretary and Registrar of the Province for the year 1913. Presented to the Legislature, April 15th, 1914. *Printed.*

No. 20 Report of the Registrar-General upon Births, Marriages and Deaths for the year 1913. Presented to the Legislature, March 27th, 1913. *Printed.*

No. 21 Report of the Provincial Board of Health for the year 1913. Presented to the Legislature, March 16th, 1914. *Printed.*

No. 21*a* Special Report of the Provincial Board of Health on the work of the District Officers of Health for the year 1912-13. Presented to the Legislature, March 6th, 1914. *Printed.*

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No. 22 Report upon the Hospitals for the Insane for the year 1913. Presented to the Legislature, April 21st, 1914. *Printed.*

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No. 23 Report upon the Hospitals for Idiots and Epileptics at Orillia and Woodstock for the year 1913. Presented to the Legislature, April 28th, 1914. *Printed.*

No. 24 Report upon the Feeble-minded of the Province for the year 1913. Presented to the Legislature, April 23rd, 1914. *Printed.*

No. 25 Report upon the Hospitals and Charities for the year 1913. Presented to the Legislature, April 14th, 1914. *Printed.*

No. 26 Report upon the Prisons and Reformatories of the Province for the year 1913. Presented to the Legislature, April 21st, 1914. *Printed.*

No. 27 Report on Neglected and Dependent Children for the year 1913. Presented to the Legislature, April 15th, 1914. *Printed.*

No. 28 Report upon the operation of the Liquor License Acts, Ontario, for the year 1913. Presented to the Legislature, February 27th, 1914. *Printed.*

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No. 29 Report of the Department of Agriculture for the year 1913. Presented to the Legislature, April 22nd, 1914. *Printed.*

No. 30 Report of the Agricultural College for the year 1913. Presented to the Legislature, April 22nd, 1914. *Printed.*

No. 31 Report of the Veterinary College for the year 1913. Presented to the Legislature, April 22nd, 1914. *Printed.*

No. 32 Report of the Agricultural and Experimental Union for the year 1913. Presented to the Legislature, April 22nd, 1914. *Printed.*

No. 33 The Fruits of Ontario. Presented to the Legislature, April 9th, 1914. *Printed.*

No. 34 Report of the Vegetable Growers' Association for the year 1913. Presented to the Legislature, April 16th, 1914. *Printed.*

No. 35 Report of the Corn Growers' Association for the year 1913. Presented to the Legislature, April 22nd, 1914. *Printed.*

No. 36 Report of the Entomological Society for the year 1913. Presented to the Legislature, April 22nd, 1914. *Printed.*

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No. 37 Report of the Bee-Keepers' Association for the year 1913. Presented to the Legislature, April 22nd, 1914. *Printed.*

No. 38 Report of the Dairymen's Association for the year 1913. Presented to the Legislature, April 22nd, 1914. *Printed.*

No. 39 Report of the Live Stock Associations for the year 1913. Presented to the Legislature, March 3rd, 1914. *Printed.*

No. 40 Report of the Farmer's Institutes for the year 1913. Presented to the Legislature, April 9th, 1914. *Printed.*

No. 41 Report of the Women's Institutes for the year 1913. Presented to the Legislature, April 9th, 1914. *Printed.*

No. 42 Report of the Agricultural Societies of the Province for the year 1913. Presented to the Legislature, April 9th, 1914. *Printed.*

No. 43 Report of the Horticultural Societies of the Province for the year 1913. Presented to the Legislature, April 22nd, 1914. *Printed.*

No. 44 Report of the Fruit Growers' Association for the year 1913. Presented to the Legislature, April 22nd, 1914. *Printed.*

No. 45 Report of the Bureau of Industries for the year 1913. Presented to the Legislature, April 23rd, 1914. *Printed.*

No. 46 Report of the Inspectors of Factories for the year 1913. Presented to the Legislature, April 22nd, 1914. *Printed.*

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No. 47 Report of the Timiskaming and Northern Ontario Railway Commission for the year 1913. Presented to the Legislature, March 23rd, 1914. *Printed.*

No. 48 Report of the Hydro-Electric Power Commission for the year 1913. Presented to the Legislature, March 16th, 1914. *Printed.*

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No. 49 Report of the Ontario Railway and Municipal Board for the year 1913. Presented to the Legislature, April 24th, 1914. *Printed.*

No. 50 Return from the Records of the Bye-elections held on the second day of June, the fourteenth day of July, the eighth day of September, and the twenty-seventh day of November, 1913. Presented to the Legislature, February 18th, 1914. *Printed.*

No. 51 Report of the Provincial Archivist for the year 1913. Presented to the Legislature, April 15th, 1914. *Printed.*

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No. 52 Report upon the state of the Library. Presented to the Legislature, April 23rd, 1914. *Not Printed.*

No. 53 Final Report of Commissioner on Laws relating to the Liability of Employers to make Compensation to their Employees. Presented to the Legislature, March 27th, 1914. *Printed.*

No. 54 Statements of Provincial Auditor for the year 1912-13. Presented to the Legislature, March 19th, 1914. *Printed.*

No. 55 Copies of Orders-in-Council and Regulations under section 27 of the Department of Education Act. Presented to the Legislature, February 25th, 1914. *Printed.*

No. 56 Bulletin of the Ontario Hospitals for the Insane. Presented to the Legislature, February 27th, 1914. *Printed.*

No. 57 Regulations respecting Rondeau Provincial Park, 1913. Presented to the Legislature, February 27th, 1914. *Printed.*

No. 58 Return to an Order of the House of the 27th March, 1913, for a Return showing:—1. Copies of all correspondence between the Minister of Public Works or any other member of the Government or any official thereof, and any person or persons relating to the floods on the Grand River or any other river in the Province during the years 1908, 1909, 1910, 1911, 1912. 2. Copies of all petitions received during the said years by the Government or any Minister of the Government from any person or persons relating to the floods on the Grand River or any other river in the Province, or requesting the Government to take action towards the prevention of floods. 3. Copies of all reports made by any engineer or engineers employed on behalf of the Government or on behalf of the Hydro-Electric Power Commission, for the purpose of investigating the floods on the Grand River or any other river in the Province, or the means of preventing or mitigating such floods or of conserving and regulating the flow of such rivers or investigating the electrical power potentialities of such rivers. Presented to the Legislature, February 27th, 1914. Mr. *Marshall. Not Printed.*

No. 59 Return to an Order of the House of the 22nd April, 1913, for a Return showing:—Copies of all correspondence between the Attorney-General or any other member of the Government or any official of the Government and any other person or persons relating to:—1. The prosecution of one Goodman, formerly Chief of Police at New Liskeard on November 12th last, for an offence against the Game Laws. 2. The conduct of one McKelvie, an overseer of the Game and Fisheries Department at

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New Liskeard, Ont., or the dismissal of the said McKelvie from his position. 3. The prosecution of one Eli Tibbs in November, 1912, for illegal possession of furs. 4. The prosecution of any party or parties for illegal possession of furs seized by the said McKelvie from one Angus Wabi. Presented to the Legislature, February 27th, 1914. Mr. *Elliott.* *Not Printed.*

No. 60 A Return to an Order of the House of the 15th April, 1913, for a Return showing:—1. In detail the persons to whom the sum of $19,946.18, appearing an page 323 of the Public Accounts, 1912, was advanced by N. B. Colcock, and the purposes for which the same was advanced. 2. In detail the persons to whom the sum of $11,060.85, appearing on page 372 of the Public Accounts was paid by N. B. Colcock, and the purposes for which the same was paid. Presented to the Legislature, March 3rd, 1914. Mr. *Anderson* (*Bruce*). *Not Printed.*

No. 61 Copies of Orders-in-Council authorizing payments out of Surrogate of the Counties of York and Simcoe in accordance with the provisions of the Surrogate Courts Act. Presented to the Legislature, March 10th, 1914. *Not Printed.*

No. 62 Return to an Order of the House of the 11th March, 1913, for a Return showing for what Municipalities was the Report of the Lieutenant-Governor in Council in favour of, or against, building an electric railway for such Municipalities. Presented to the Legislature, March 16th, 1914. Mr. *Elliott.* *Printed.*

No. 63 Copies of Orders in Council in accordance with the provisions of sec. 2, cap. 2, 2 George V, An Act for raising money on the Credit of the Consolidated Revenue Fund of Ontario. Presented to the Legislature, March 16th, 1914. *Not Printed.*

No. 64 Return to an Order of the House of the 2nd March, 1914, for a Return showing:—1. What securities have been sold by the Province since October 31st, 1912. 2. What was the date of the sales. 3. What are the names of the purchasers. 4. What are the prices at which such securities were sold. Presented to the Legislature, March 16th, 1914. Mr. *Sinclair.* *Not Printed.*

No. 65 Return to an Order of the House of the 27th February, 1914, for a Return showing:—1. What timber limits, or areas, have been sold by the Government since the first day of January, 1913, and the total area of each. 2. The price at which each such limit, or area, was sold. 3. The names of the respective purchasers and if any were sold at public auction. 4. And if any were so sold at auction, which limit or area was so sold, and the dates on which the several sales took place. Presented to the Legislature, March 18th, 1914. Mr. *Mageau.* *Not Printed.*

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No. 66 Return to an Order of the House of the 6th March, 1914, for a Return showing:—1. Application for license of William Smuck of the Township of Bayham in the electoral district of East Elgin for the year 1913-14; the granting thereof; the withdrawal of such application; all correspondence between the Department and any officer thereof and the said Smuck, or the License Inspector or other residents of East Elgin in reference thereto. 2. The application of the said Smuck to be appointed License Inspector for East Elgin, and all protests against his appointment. 3. All letters, reports or communications in reference to the health or work by the former License Inspector, Mr. W. R. Andrews. 4. The resignation of the former License Inspector or Notice of the Termination of his employment. 5. All protests or complaints during the years 1912, 1913 and 1914 from residents of Aylmer or other citizens of East Elgin in reference to the lack of enforcement of the License Law and the conduct of the hotels in Aylmer or of license officials of East Elgin. Presented to the Legislature, March 27th, 1914. Mr. *Rowell. Not Printed.*

No. 67 Minutes of the Proceedings in Conference of the Representatives of the Provinces, October, 1913. Presented to the Legislature, March 19th, 1914. *Printed.*

No. 68 Return to an Order of the House of the 2nd March, 1914, for a Return showing:—1. What amount was received by the Government from Messrs. Taylor, Scott & Co. for the work done by prisoners from Central Prison under its contract with Taylor, Scott & Co., dated 1st September, 1905, for each year during which the contract was in force. 2. How long was the contract in force. 3. What amounts were paid by the Government for debt, damages or costs respectively in connection with or arising out of the said contract. 4. To whom were such amounts paid. 5. Was the agreement between Taylor, Scott & Co. and the Government changed after the agreement had been submitted to the House and approved by it. 6. If it were changed, were such changes embodied in an agreement in writing between the parties. 7. If it was changed, was such change or modified agreement submitted to the House for approval. Presented to the Legislature, March 23rd, 1914. Mr. *Bowman. Not Printed.*

No. 69 Return to an Order of the House of the 18th March, 1914, for a Return showing:—1. The names of the license holders under the Liquor License Act in the City of Toronto for the year from 1st May, 1908, to 1st May, 1909, and the place or places of business in which each license holder carried on business. 2. The names of those license holders under the said Act, and the location of the premises in which they carried on business, whose licenses were cut off or were not renewed in the year

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1909 in Toronto. 3. The names of the license holders in Toronto whose licenses were transferred with the approval of the Board of License Commissioners in the years 1909, 1910, 1911, 1912 and 1913; the places in which they carried on business; the names of the persons to whom licenses were transferred; and the locations of the premises in which the persons to whom the licenses were transferred carried on business. Presented to the Legislature, March 23rd, 1914. Mr. *Proudfoot.* *Not Printed.*

No. 70 Return to an Order of the House of the 26th March, 1913, for a Return showing:—1. All the correspondence (including telegrams) passing between the Prime Minister, the Attorney-General, the Minister of Crown Lands or any other member or official of the Government and the Counsel or Solicitors for Keewatin Power Company, or the Counsel or Solicitors for the Hudson's Bay Company with reference to the action brought by these Companies against the Town of Kenora for a declaration that they and not the Crown were the owners of the water power on the East Branch of the Winnipeg River, and that the lease from the Crown to the Town of Kenora was invalid. 2. A copy of the telegram (if any) sent by the Prime Minister to the Counsel for the Keewatin Power Company advising him that the Government did not desire to defend its own title to the water power or be added as a party to the action. 3. All correspondence (including telegrams passing between the Town of Kenora or the Counsel or Solicitors for the Town of Kenora, and the Government or any Minister or official thereof with reference to these actions, and particularly all communications requesting the Crown to take part in the defence of its own title to the water power. 4. Copies of all correspondence (including telegrams) passing between the Prime Minister, Attorney-General, the Minister of Crown Lands or any other Minister or official of the Government, and Mr. W. H. Hearst, acting as Counsel for the Government, in reference to these actions. 5. Copy of the judgments of the Trial Judge and the Court of Appeal. Presented to the Legislature, March 24th, 1914. Mr. *Rowell.* *Not Printed.*

No. 71 Revised Rules, Orders and Forms of the Division Courts of the Province of Ontario. Presented to the Legislature March 26th, 1914. *Printed.*

No. 72 Correspondence and Papers relating to timber in the Algonquin Park Forest Reserve. Presented to the Legislature, March 27th, 1914. *Printed.*

No. 73 Whitson's Report upon Road Construction in Northern Ontario. Presented to the Legislature, March 30th, 1914. *Printed.*

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No. 74 Return to an Order of the House of the 27th February, 1914, for a Return showing:—1. The names of the tenderers for the supply of coal for Government Institutions, in Toronto, during the years 1910, 1911, 1912 and 1913, respectively. 2. The amount of each tender for each of such years. 3. The names of the contractor or contractors for each of such years. 4. The amount of coal supplied under each contract during each year. 5. The prices at which the coal was purchased. Presented to the Legislature, March 31st, 1914. Mr. *Bowman*. *Not Printed.*

No. 75 Return to an Order of the House of the 27th February for a Return showing:—1. What buildings have been erected by the Province at the Prison Farm at Guelph. 2. What has been the total cost to the Province of each building. 3. Were any of these buildings built by prison labour in whole or in part. 4. If so, what buildings, and what class of prison labour was employed. 5. And if the statement of cost makes any allowance for the prison labour employed, if any. Presented to the Legislature, March 31st, 1914. Mr. *Atkinson*. *Not Printed.*

No. 76 Return to an Order of the House of the 18th March, 1914, for a Return showing:—1. Whether the Minister of Agriculture or any officer or official of his Department, or the Minister of Education or any officer or official of his Department, communicated with the district representative of Agriculture within the County of Welland with reference to his attitude to the Canada Temperance Act or the vote to be taken thereon on the 29th January last. 2. And if any communication was made, was such communication verbal or in writing. 3. And who was the officer making the same, and what was the date thereof. Presented to the Legislature, March 31st, 1914. *Not Printed.*

No. 77 Return to an Order of the House of the 27th March, 1914, for a Return showing:—1. The conditions upon which grants are made to rural public schools. 2. Were the grants to the rural public schools of Ontario in 1913 less per school in 1913 than they were in the year 1912. If so, how much. 3. Has the Department of Education notified the Boards of Public School Trustees of Rural Schools, or any of them, that they cannot pay the grant provided for by the regulations. 4. If such notice has been given, upon what their ground for refusing to pay the grants. 5. Has the Department of Education notified the School Boards of Rural Schools, or any of them, that the grants this year would be cut down 28 *per cent.*, or any amount whatever. If so, how much. Presented to the Legislature, April 1st, 1914. Mr. *Kohler*. *Not Printed.*

No. 78 Return to an Order of the House of the 30th March, 1914, for a Return showing:—1. What was the estimated cost of the heating plant for the Toronto University. 2. What was the actual cost of the plant when fully completed. 3. Has the total amount

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been paid; if not, what amount, if any, is held in reserve. 4. And if the heating plant is giving satisfaction. Presented to the Legislature, April 1st, 1914. Mr. *Bowman*. *Not Printed.*

No. 79 Return to an Order of the House of the 1st April, 1914, for a Return of copies of all correspondence, resolutions or other documents received by, or on behalf of any Member of the Government in any way relating to the Hamilton Athletic Association regarding which certain legislation is sought for during the current Session. Presented to the Legislature, April 2nd, 1914. Mr. *Studholme*. *Not Printed.*

No. 80 Return to an Order of the House of the 1st April, 1914, for a Return showing:—1. What sum of money has Sir William Meredith, the Chief Justice of Ontario, received from the Government in addition to his salary as Chief Justice, since January 1st, 1909, to date. 2. In what capacity did Chief Justice Sir William Meredith receive such sum or sums, and what amount was received with respect to each capacity in which he received any sum or sums as aforesaid. Presented to the Legislature, April 2nd, 1914. Mr. *Anderson (Bruce)*. *Not Printed.*

No. 81 Return to an Order of the House of the 27th March, 1914, for a Return showing:—1. If there was a deficit in the financial operations of the Provincial University for the fiscal year ending 1912. If so, how much. 2. Was there a deficit in the financial operations of the Provincial University for the fiscal year 1913. If so, how much. 3. If there have been deficits during the years 1912-13, or either of them, how have these deficits been provided for. 4. What is the estimated expenditure of the Provincial University for the current fiscal year. 5. What is the estimated revenue of the University for the current fiscal year. Presented to the Legislature, April 2nd, 1914. Mr. *Marshall*. *Not Printed.*

No. 82 Return to an Order of the House of the 27th March, 1914, for a Return showing:—1. If there was an option given to the firm of Murray, Mather & Co. to purchase certain Government securities during the calendar year 1913. 2. If so, what was the date of the option, and what were the character, amount and price of the securities covered by it. 3. Was such option, if any, exercised; and if so, to what extent. Presented to the Legislature, April 3rd, 1914. Mr. *Sinclair*. *Not Printed.*

No. 83 Return to an Order of the House of the 27th March, 1914, for a Return showing:—1. Copy of evidence of Mr. Taylor, of Messrs. Taylor, Scott & Co., given before the Dominion Penitentiary Investigation Commission, of which Mr. G. M. Macdonald, K.C., of Kingston, is Chairman, and which was taken in Shorthand by a Stenographer provided by Dr. Gilmour,

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Warden of the Central Prison, such evidence or a copy thereof being now in the custody or control of the Provincial Secretary, or of some of the officers or officials of his Department, or of the institutions under the control of his Department. 2. Copies of all correspondence passing between the Provincial Secretary, or any officer or official of his Department, or any officer or official of any of the institutions under the charge of his Department, and Mr. Joseph Downey, in reference to the said evidence or the production thereof. Presented to the Legislature, April 3rd, 1914. Mr. *Bowman.* *Not Printed.*

No. 84 Report of the Good Roads Commission. Presented to the Legislature, April 7th, 1914. *Printed.*

No. 85 Copy of an Order-in-Council approved by His Honour the Lieutenant-Governor, under the provisions of 552 of sec. 18 of the Municipal Drainage Act. Presented to the Legislature, April 8th, 1914. *Printed.*

No. 86 Return to an Order of the House of the 2nd March, 1913, for a Return showing:—1. Copies of all correspondence between the Minister of Education or any other member or official of the Government and any other person or persons during 1910, 1911 and 1912, relating to the investigation made by Dr. Merchant of the bi-lingual or French-English Schools in Ontario. 2. Copies of all correspondence between the Minister of Education or any other member or official of the Government and any other person or persons during the year 1912, relating to Regulation No. 17. Presented to the Legislature, April 9th, 1914. Mr. *Mageau.* *Not Printed.*

No. 87 Return to an Order of the House of the 7th April, 1914, for a Return showing:—1. How much the Hydro-Electric Power Commission has spent in building the trunk line from Morrisburg to Prescott, and from Morrisburg to Winchester and Chesterville. 2. Did the Hydro-Electric Power Commission enter into an agreement with the New York and Ontario Power Company, or any person on their behalf, for a supply of power for transmission on this line, to be developed at Waddington or elsewhere; and if so, what is the date of such agreement. 3. Was it a term of any such agreement that the Directors of the New York and Ontario Power Company became personally liable if power was not supplied within a certain defined time. 4. Has the Hydro-Electric Power Commission entered into any agreement with the Rapids Power Company for the supply of power; if so, what is the date of such agreement. Presented to the Legislature, April 9th, 1914. *Not Printed.*

No. 88 Coles' Report, Mining Engineer, Timiskaming and Northern Ontario Railway Company. Presented to the Legislature, April 28th, 1914. *Printed.*

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No. 89 Return to an Order of the House of the 8th April, 1914, for a Return showing:—1. The number of convictions for intoxication in Local Option Municipalities. 2. Convictions for other offences against Local Option Law during the license year 1912-13. Presented to the Legislature, April 14th, 1914. Mr. *McPherson*. *Not Printed.*

No. 90 Official Regulations for the Government of the Andrew Mercer Reformatory. Presented to the Legislature, April 16th, 1914. *Printed.*

No. 91 Official Regulations for the Government of the Hospitals and Public Charities of Ontario. Presented to the Legislature, April 16th, 1914. *Printed.*

No. 92 Official Regulations for the Government of Common Gaols of Ontario. Presented to the Legislature, April 16th, 1914. *Printed.*

No. 93 Official Regulations for the Government of Industrial Farms in Ontario. Presented to the Legislature, April 16th, 1914. *Printed.*

No. 94 Official Regulations for the Government of the Ontario Reformatory. Presented to the Legislature, April 16th, 1914. *Printed.*

No. 95 Official Regulations of the Ontario Hospitals. Presented to the Legislature, April 17th, 1914. *Printed.*

No. 96 Statement of Statute distribution for 1913. Presented to the Legislature, April 21st, 1914. *Not Printed.*

No. 97 Return to an Order of the House of the 27th March, 1913, for a Return showing:—Copies of all Orders in Council passed under Section 8, of the Power Commission Act, as amended by the Power Commissions Act, 1912. Presented to the Legislature, April 21st, 1914. Mr. *Mageau*. *Not Printed.*

No. 98 Return to an Order of the House of the 1st April, 1914, for a Return showing:—1. All the schools in the Province, both public and separate, from which the Government grant has been withheld during the years 1912 and 1913 respectively. 2. The grounds upon which such grants have been withheld from the said schools respectively. 3. The grounds upon which County Councils are required to withhold from schools the moneys raised by taxation from the people. Presented to the Legislature, April 21st, 1914. Mr. *Racine*. *Not Printed.*

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No. 99 Return to an Order of the House of the Twenty-first day of April instant for a Return of a Copy of the Letters, or Charter, of the "Ontario Homes Company, Limited," giving the Corporation license to promote a company for the purpose of engaging in the business of the purchase of real estate in manufacturing localities and showing what, if any, returns have been made to the Department and if the company is still doing business. Presented to the Legislature, April 22nd, 1914. Mr. *Studholme. Not Printed.*

No. 100 Return to an Order of the House of the 16th April, 1914, for a Return showing:—The quantity of settlers' effects delivered over the T. & N. O. Railway at New Liskeard and Cochrane, respectively, and carried as such under the regulations of the said Railway, for the financial year ending October 31st, 1913. Presented to the Legislature, April 24th, 1914. Mr. *Atkinson. Not Printed.*

No. 101 Return to an Order of the House of the 17th February, 1913, for a Return of: Copies of all correspondence between Bishop Fallon, of London, and the Provincial Secretary, the Minister of Public Works or any Member of the Government regarding the Bi-lingual Schools in the Province of Ontario, since the first day of May, 1910. Presented to the Legislature, April 24th, 1914. Mr. *Evanturel. Not Printed.*

No. 102 Return to an Order of the House of the 17th February, 1913, for a Return of Copies of all correspondence between Bishop Scollard, of Sault Ste. Marie, and the Government, regarding the Bi-lingual Schools of the Province of Ontario, since the first day of March, 1907. Presented to the Legislature, April 24th, 1914. Mr. *Evanturel, Not Printed.*

No. 103 Return to an Order of the House of the 16th April, 1914, for a Return showing:—1. All correspondence between the Department of Education and any officer or official thereof and the Board of Trustees of the Almonte High School. 2. All correspondence between the Department of Education and any officer or official thereof and any of the teachers in the Almonte High School. 3. All correspondence between the Department of Education and any officer or official thereof and Miss Eade with reference to an application by her for a position in the Almonte High School. Presented to the Legislature, April 28th, 1914. Mr. *Marshall. Not Printed.*

No. 104 Return to an Order of the House of the 21st April, 1914, for a Return showing:—1. The present practice of the Department of Education in regard to the number of text-books authorized for use in each subject in the Course of Studies. 2. The number of text-books authorized for use in the elementary and secondary

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schools of Ontario issued since the date of the last return laid before this House, March 20th, 1911, and the methods adopted to keep these books up to the requirements of the schools. 3. The cost to the Province of each of these books in the form of payments to authors, printers and electrotypers. 4. The estimated saving to purchasers of all text-books in elementary and secondary schools on all the books as compared with previous prices of the same. 5. The amount annually paid in royalties by the Department of Education to writers of authorized text-books. 6. The cost to the Province of the preparation, editing, and printing of supplementary readers authorized for use in the schools. 7. The amount paid annually by publishers to any official of the Department of Education on text-books authorized for use in the schools of this Province. 8. What Ontario books have been adopted in other Provinces. Presented to the Legislature, April 28th, 1914. Mr. *Musgrove*. *Printed.*

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REPORT

OF THE

Minister of Agriculture

PROVINCE OF ONTARIO

FOR THE YEAR ENDING
OCTOBER 31, 1913

PRINTED BY ORDER OF
THE LEGISLATIVE ASSEMBLY OF ONTARIO

TORONTO:
Printed by L. K. CAMERON, Printer to the King's Most Excellent Majesty
1914.

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Old Ontario still leads in fertility and natural beauty.

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REPORT

OF THE

Minister of Agriculture

1913

To The Honourable Sir John Morison Gibson, K.C.M.G.,
Lieutenant-Governor of the Province of Ontario.

May it Please Your Honour:

I have the honour to submit the Annual Report of the Department for the fiscal year ending October 31, 1913.

Each year brings its changes, extensions, and, I trust, improvements in the work of the Department. During the past year the most notable extension in the work has been occasioned by the arrangement entered into with the Federal authorities by which additional sums of money were made available for work through this Department. In my last Report I referred to the temporary arrangement which was adopted for the year 1912, pending an enquiry into the whole subject, and I then suggested the possibility of a plan of this nature becoming permanent. I am glad to say that my anticipations in this respect were fully realized. At the last Session of the Federal Parliament an Act was passed at the instigation of the Federal Minister of Agriculture setting aside the sum of ten million dollars to be spent for agricultural instruction and demonstration through the Provinces, covering a period of ten years. The plan was marked by many admirable features. The money set apart was adequate, at least for a start, and the decision fixing a period of ten years gave a permanence which cannot but be conducive to the best results. The money is to be divided on the basis of population, with special provision to help the smaller Provinces and also special provision for Veterinary Colleges. The sum of $700,000 was divided last year and of this, Ontario received $195,000. This will be increased at the rate of $35,000 a year till a maximum of $363,319 is attained, and Ontario's grant will stand at this figure for the balance of the ten year period unless the Federal Act is changed in the meantime. The Bill restricts the expenditure to instruction and demonstration work, and while it thereby eliminates many lines of agricultural activity, it is at the same time broad enough to be productive of great good. The money is paid over to the Province on an agreement being entered into between the Minister of Agriculture for the Province and the Minister for the Dominion setting forth the purposes for which it is to be expended. The agreement which I had the pleasure of entering into for the past year for the expenditure of the Ontario portion made provision for the following:

District Representative	$80,000 00
O. A. C. Short Course travelling and living expenses of winners of Acre Profit Competition	1,500 00
To encourage agriculture in the Public Schools, to be available for grants and for travelling and living expenses of teachers in attendance at Short Courses or other educational gatherings in addition to services, expenses and equipment and to be paid out on the recommendation of the Department of Education	10,000 00

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Educational work in connection with marketing of farm products, including organization of co-operative societies, collection, printing and distributing of information on current prices and systems of marketing		5,500 00
Buildings at Ontario Agricultural College, Poultry Building for administration, class room and laboratory purposes	$30,000 00	
To finish and equip field husbandry building	10,000 00	
Apiary Administration Building	6,000 00	
To remodel and equip Bacteriological Department	2,500 00	
Extensions and equipment Dairy Barn	3,000 00	
		51,500 00
Stock and Seed Judging Short Courses and Institute Work		7,500 00
Women's Institute Work, including Courses in Cooking, Sewing, etc.		6,500 00
Short Courses for Fall Fair and Field Crop Judges, including travelling and living expenses		5,500 00
Drainage Work		5,000 00
Demonstrations and instruction in vegetable growing		2,500 00
Demonstration work on Soils		2,500 00
Demonstrations and instruction on live stock and poultry		4,000 00
Demonstration work for spraying, pruning and packing of fruits		3,000 00
Demonstrations in Beekeeping		1,000 00
Ontario Veterinary College, additional land		5,000 00
Lectures on Horticulture		500 00
Miscellaneous		4,233 32
		$195,733 32

This money is being very largely spent under the organization of the Department and hence entails very little outlay for executive management. Hence also a reference to the work will be found in more detail in the review of the different Branches of the Department. I merely desire here to acknowledge the co-operation of the Department of Agriculture and the Minister of Agriculture for Canada not only in the adoption of this splendid plan but in the very sympathetic and cordial manner in which it has been administered.

Reference is made in some detail under the heads of the Branches to the work which has been carried on during the past year. I would like here to mention one or two matters of general interest.

Early in the year my attention was called to the fact that a large Commission, representative of all the States of the American Union was being organized to visit Europe and Great Britain with a view to studying co-operation and rural finance. An opportunity was extended to the Provinces of Canada to join this Commission, and several of the Provinces, including the Province of Ontario, availed themselves of this opportunity. Ontario was represented by the Assistant Deputy Minister of this Department. The Commission went into the matter very thoroughly and their Report makes available perhaps one of the most complete and up-to-date bodies of information on the very important subject of co-operation and rural finance that has yet been compiled. Ontario, therefore, has the advantage of this information, and it will be brought to the attention of the people of the Province and utilized in connection with the work of the Department in various ways from time to time.

In regard to rural finance, some further information was gathered in our own Province. A letter was addressed to the District Representatives, of whom we have now thirty-seven located in thirty-seven different centres in the Province, asking them to secure what information they could on this subject, especially with reference to the following points:—

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1. The percentage of farms mortgaged and per cent. of mortgage on value of farms, and whether increasing or decreasing.

2. The extent of deposits by farmers in savings banks.

3. The extent of the demand on the part of farmers for loans.

4. Rate of interest paid both on long and short time loans.

5. Whether the loans are on the purchasing of land only or for financing farm operations.

In gathering this information they conferred with bankers, business men, lawyers, registry office officials and prominent farmers. As is well known, men of this type are usually in close touch with the conditions of their communities both by reason of their position and by reason of the fact that they have lived a long time in the district. The information which has thus been secured should therefore be reasonably reliable.

Answers to the first question pertaining to mortgages elicited the fact that about 45 per cent. of the farms of the Province are mortgaged to some extent, and that one-third would be a fair estimate of the amount which the mortgage represents to the total value of the property. This means that mortgages against farm property in the Province represent only about 15 per cent. of the total value of farm property, which must be taken as a very encouraging sign. Moreover, a considerable percentage of these mortgages are held by farmers. Opinions were also unanimous that mortgages are steadily decreasing. Practically every County reported that payments were being kept up very promptly and a large number of mortgages were being wiped off each year. In many cases it was pointed out that mortgages, while they are frequently taken as a barometer of prosperity, are not altogether an unhealthy sign, as many are placed in order to secure money to extend the land holdings, erect buildings, plant out orchards, put in underdrainage or effect other improvements which were in the nature of investment. In a few cases, unfortunately, it was reported that mortgages had been placed on farms in order to raise money for speculation in western real estate, and there are too many indications that a great deal of money of Ontario farmers has been used for this purpose and has not brought the returns anticipated.

In the matter of deposits of farmers there was also a unanimity of opinion that these had increased materially in recent years. In one County the bankers estimated that the deposits had increased from 20 per cent. to 30 per cent. in the last few years. In another County it was estimated that 70 per cent. to 90 per cent. of the money deposited in local banks was deposited by the farmers. Another County estimated that 75 per cent. of the farmers had savings running from $700 to $12,000 each. As to the total amount of deposits of farmers' money, only a general estimate can, of course, be given. One County estimated that between three and four million dollars of farmers' money was deposited in the local branch banks, while other estimates ranged from two to five million dollars. Under these circumstances it would seem safe to estimate the total amount of farmers' deposits in rural Ontario at one hundred million dollars for the entire Province. While this may appear to be a very large figure, it should be remembered that the aggregate farm wealth of Ontario, including land, buildings, implements and live stock is placed at $1,405,950,940, by the Bureau of Industries Report, and that a very large amount is required as a working capital in conducting the farm operations on a plant which represents such a large investment. This would only mean an average of about $600 per farm, but of course at the same time it

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is recognized that all the surplus money of the farmers is not deposited in the banks, although unquestionably a considerable proportion of it is.

As to the demand on the part of farmers for loans, the concensus of opinion appeared to be that the demand was not very heavy, representing only a small portion of the total deposits. The banks, of course, do not loan money for the purchase of land, but the opinion is general that no farmer who enjoyed a good reputation and could give reasonable security had any difficulty in securing money needed to finance his farm operations, which was the chief purpose for which loans were sought. The rate of interest charged varied from 5½ per cent. on long time loans to 7 per cent. on short time loans, with occasionally rates of 8 per cent. and 10 per cent. in some of the newer districts. These figures were collected at the time when the money stringency was at its height and money generally was scarce, so that they would not represent normal conditions. In every instance it appeared that the farmers were able to secure financial accommodation on the same terms and basis as those engaged in other occupations.

These facts would indicate that the financial conditions of the Province are sound and that the outlook is healthful.

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ONTARIO AGRICULTURAL COLLEGE.

Progress and popularity are the two words which best describe the record of the Ontario Agricultural College during the past year. The increasing opportunities of securing agricultural instruction nearer home provided by the Department in all parts of the Province have not lessened the demands on this central institution of agricultural instruction. On the contrary, they appear to have proven an even greater incentive and as a consequence when the College opened its doors again last September, it was invaded by a freshman class numbering 225, forty per cent. larger than the freshman class of the previous year and practically double that of ten years ago. The following figures show the total attendance in all departments:

ONTARIO AGRICULTURAL COLLEGE.

General Course	609	
Specialists in General Course Work	9	
Manual Training (One Year Normal Course)	5	
Teachers' Course (Agriculture and Horticulture)	17	
Dairy Course	37	
Stock and Seed Judging	189	
Poultry Raising	30	
Fruit Growing	104	
Apiculture	60	
		1,060

MACDONALD INSTITUTE.

Domestic Science	271	
Nature Study (78), Elementary Agriculture and Horticulture (44), High School Science Teachers (27), Public School Inspectors (80)	229	
		500
Total		1,560

N.B.—There were also 110 children from the Guelph Public Schools who received instruction in Domestic Science at Macdonald Institute.

From Ontario.

Algoma	7	Huron	10	Peel	5
Brant	26	Kent	8	Perth	8
Bruce	7	Lambton	20	Peterboro	5
Carleton	16	Lanark	3	Prescott	2
Dufferin	7	Leeds	5	Rainy River	2
Dundas	6	Lennox	2	Renfrew	1
Durham	7	Lincoln	16	Russell	2
Elgin	12	Middlesex	22	Simcoe	11
Essex	6	Muskoka	3	Thunder Bay	1
Frontenac	5	New Ontario	1	Victoria	3
Glengarry	3	Nipissing	5	Waterloo	12
Grenville	6	Norfolk	16	Welland	8
Grey	5	Northumberland	13	Wellington	38
Haldimand	7	Ontario	10	Wentworth	18
Halton	7	Oxford	13	York	53
Hastings	3	Parry Sound	3		
		Total from Ontario			449

From other Provinces of the Dominion.

Alberta	16	New Brunswick	3	Quebec	4
British Columbia	31	Nova Scotia	11	Saskatchewan	10
Manitoba	7				
		Total from other Provinces			82

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From other Countries.

Argentine Republic ..	1	Ireland	2	Scotland	3
Belgium	1	India	1	South Africa	9
B. W. I.	1	Japan	1	Panama	1
Cape Breton	1	Mexico	1	Spain	2
England	28	Newfoundland	1	U. S. A.	21
Germany	1	Russia	1		
				Total from other Countries	78

From this it will be seen that although the College still draws students from all parts of the world, about 75 per cent. of those taking the general agricultural course are from the Province of Ontario, which also supplies practically all those taking the other courses. Ages ranged from 17 to 41, the average being 22. The fourth year class taking the B.S.A. degree numbered 42. Although the great majority of these accepted positions of an executive or teaching character in connection with agricultural work for which there has been a great demand, almost all those taking the other courses return to the farms there to utilize the information secured. It seems safe to say that 95 per cent. of the students attending the College go back to the land.

FINE NEW BUILDINGS.

The past year has also witnessed material additions to the equipment of the institution. For some time past the need for increased accommodation has been felt and the policy of federal aid to agriculture already referred to has greatly assisted in meeting this need. In addition to the new dining hall and new dairy barn being financed from Provincial funds, we have a new Field Husbandry Building and a new Poultry Building being constructed with federal aid. The new dairy barn and new Field Husbandry Building are now complete. The barn is modern in every particular and accommodates 50 animals aside from calf runs, etc. The new Field Husbandry Building is a valuable addition to the teaching equipment of the College. It is well arranged and well lighted for class room and laboratory purposes, one room alone accommodating 400 students. Not only is it well calculated to serve this important branch of agriculture, but the removal of this department from the old building has with a little rearrangement given very much needed accommodation to the bacteriology department.

The new dining hall will, it is expected, be ready for next term. It is of appropriate stone architecture, with most modern equipment and accommodation for upwards of 500 students at one time. The new poultry building, while it may be partially used before, will be complete for next term.

These additions, while important, are but the beginning of a building program commensurate with the growing demands and needs of the institution.

IMPORTATION OF MILKING SHORTHORNS

With the removal of the embargo in Great Britain, the plan announced a year ago to import a herd of Shorthorns of the British milking strain was carried out. The Professor of Animal Husbandry visited England during the past summer for this purpose, selecting nine females and three males. These are now safely stabled at the College with the exception of one male, which has been placed at the Demonstration Farm at Monteith. Few agricultural subjects have been discussed more generally in recent years than that of the dual purpose cow. This interest was evidenced by the fact that men from many parts of the world were

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New Field Husbandry Building just completed at the O. A. C.

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in Great Britain this year eager to pick up good specimens of this type with the inevitable result that prices were comparatively high. It is hoped through this importation to show the possibilities of combining milk and beef from one animal. It is not expected that it will take the place of the specialized dairy cow, but rather that it will prove a serviceable animal for the general farmer who wants to produce a quantity of milk and at the same time raise a beef calf. The animals purchased are all long-pedigreed and registered.

NEW VARIETIES OF OATS.

Considerable attention has been again devoted during the past year by the Field Husbandry Department to the question of new varieties of oats. This crop, as is well known, is one of the most important cereal crops in the Province,

Modern new dairy barn at the O. A. C.

occupying in area as many acres as almost all the other grains combined. It has been found, however, that there are far too many varieties, some thirty different kinds being reported as growing generally in as many different sections. It is possible that the difference in many of these is very slight, but the fact that they go by a different name is a detriment. There is need, therefore, for a standardization and uniformity such as has been effected in barley, for 95 per cent. of the barley now grown in the Province is of the Mandscheuri or O.A.C. No. 21 strains introduced from the College plots within the last few years. It is therefore gratifying to know that two varieties of oats now being developed give promise of duplicating this success. These are known as O.A.C. No. 72 and

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O.A.C. No. 3. O.A.C. No. 72 is the result of repeated selections from Siberian oats over a period of years. O.A.C. No. 3 originated from a single plant selected from the regular variety of the Daubeney. The following facts as to his seven years' experience with the two varieties are reported by the Professor of Field Husbandry:

The following table gives the average number of days to mature and the average yield of straw per acre in tons, as well as the annual and the average results in percentage of hull of the seven years' tests of the O.A.C. No. 3 and the O.A.C. No. 72 oats in comparison with the American Banner.

Varieties.	Days to mature.	Yield of straw per acre. tons.	Per cent. Hull.							
			1907	1908	1909	1910	1911	1912	1913	Av.
Banner.....	111	1.90	28.3	28.6	29.6	29.6	31.3	35.5	29.2	30.3
O.A.C. No. 3.....	101	1.81	24.7	23.6	24.8	24.4	25.0	23.8	23.0	24.2
O.A.C. No. 72.....	111	2.17	27.2	25.4	28.7	28.6	27.8	28.0	25.6	27.3

The following shows the yield of grain per acre:

Varieties.	1907	1908	1909	1910	1911	1912	1213	Av.
Banner.....	65.94	83.50	70.41	73.62	30.41	73.44	74.38	67.39
O.A.C. No. 3	86.29	89.24	104.88	90.35	49.76	91.65	94.12	86.61
O.A.C. No. 72	76.38	86.82	102.94	93.59	43.97	114.12	105.74	89.08

It will be seen from the foregoing tables that in the average results of the seven years' experiments the Vick's American Banner and the O.A.C. No. 72 oats ripened at the same time, but the O.A.C. No. 3 variety is exactly ten days earlier. It will also be noticed from the average results that the O.A.C. No. 72 variety possesses a large amount of straw, giving fully one-quarter of a ton per acre per annum more than the Banner variety.

The detailed results show that in percentage of hull the Vick's American Banner was the highest and the O.A.C. No. 3 was the lowest in each of the seven seasons; the average for the O.A.C. No. 3 being 24.2, for the O.A.C. No. 72, 27.3, and for the Banner, 30.3. It will therefore be seen that each one hundred pounds of O.A.C. No. 3 oats contains six pounds, and each one hundred pounds of the O.A.C. No. 72 oats contains three pounds of oat kernels or oatmeal more than the same weight of the Banner variety. The quality of oats is a factor which is too frequently ignored in oat production.

In yield of grain per acre the results are very striking. In every year the yields per acre of the O.A.C. No. 3 and of the O.A.C. No. 72 considerably surpassed the yield of the Banner. In the average of the seven years' experiments it will be seen that the Banner was surpassed by each of the other two varieties by upwards of nineteen bushels per acre per annum. The two new varieties, each of which were originated eleven years ago from a single seed, have certainly

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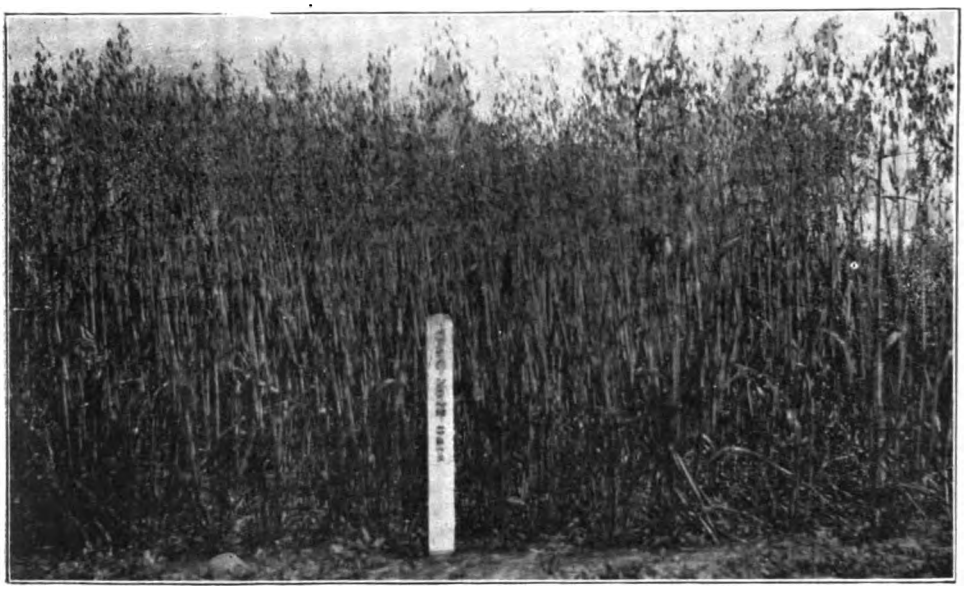
made excellent records in producing very large yields of grain of superior quality. In fact, the O.A.C. No. 3 variety of oats has proven to be better in quality than any of the other three hundred named varieties of oats which have been tested in the plots of the Ontario Agricultural College.

The O.A.C. No. 72 variety of oats was distributed in the spring of 1911 to three hundred Ontario farmers in connection with the regular co-operative work conducted through the medium of the Experimental Union. Each of these farmers sowed one pound of these oats on a plot one rod wide by two rods long in comparison with two or three other varieties. This new introduction did so well in the first year that many farmers saved their seed very carefully and sowed it on a larger plot in 1912. This seed was again carefully saved and sown on larger areas of land in the spring of the present year. In 1911, a young farmer in York County received the experimental material and his father



New strain of Oats developed at the College—O. A. C. No. 72.

also received material for a similar experiment. These tests were made separately and reported in the autumn. The father then transferred to his son the product of the one pound of the O.A.C. No. 72 oats which he had received in the experiment. The son therefore had the product of two pounds of this variety of oats to sow in the spring of 1912. He obtained about ninety bushels. He sold three bushels of these oats for $25.00 and sowed the good seed of the remainder in the spring of the present year and obtained this season about 3,300 bushels. We therefore see that one farmer obtained upwards of three thousand bushels of the O.A.C. No. 72 oats in 1913 as the direct result of two pounds of this variety which were sown in the spring of 1911.

The O.A.C. No. 3 variety of oats was distributed to the co-operative experimenters through the medium of the Experimental Union in the spring of the present year. The reports of the co-operative experiments are now being obtained and a summary of the results will be presented at the Annual Meeting in January next, and will be printed in the next annual report of the Union.

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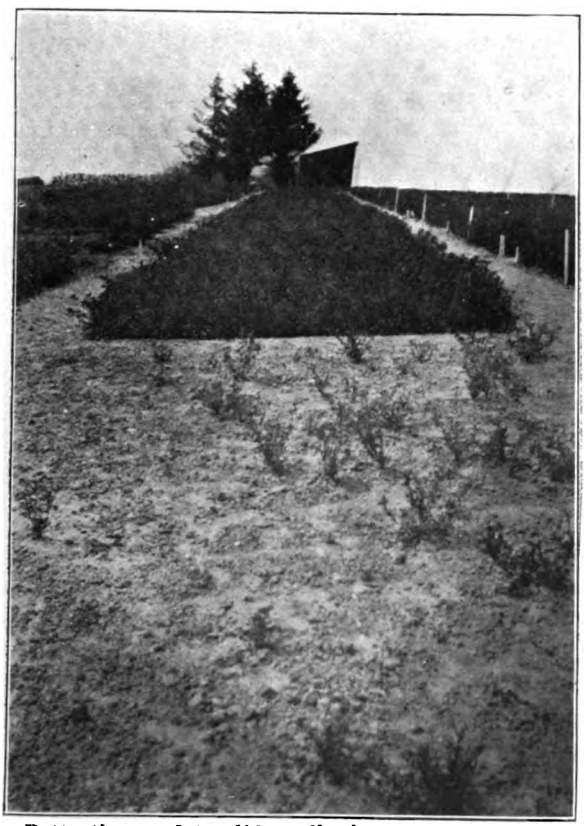
TO ENCOURAGE ALFALFA GROWING.

One of the most discussed crops at the present time is alfalfa and it has received much attention at the College and by the Department generally. Its value as a fodder and its value to the soil because of the nitrogen it takes from the atmosphere are being widely recognized, but so many farmers have tried it with poor or indifferent success that it is slow in making progress. There is no doubt, however, that a very much larger acreage could well be devoted to alfalfa in Ontario and



Both these plots did well the first year, being planted in 1909, but the common alfalfa from Colorado seed in foreground has been killing out ever since. Not the hardy Ontario variegated in background.

steps are being taken to bring this about. Results on the experimental plots in recent years have clearly demonstrated the importance of securing a hardy seed. Plots seeded with Ontario Variegated, the strain developed in south-western Ontario and acclimatized to our winters, or with Grimm, the strain developed in the North-western States, came through the winters splendidly, while other plots seeded with tender strains from the southern states have been to a large extent winter killed. Of course drainage, cultivation, inoculation and other factors must be taken into consideration, but all things being equal all experience shows that a hardy seed is necessary to ensure success in alfalfa growing in this Province. There are indications that this fact is becoming more and more recognized, but it is important that it should be brought to the attention of Ontario farmers as soon

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as possible. Accordingly a considerable quantity of hardy seed has been secured and demonstration plots of one acre in area will be sown in as many counties as possible. The work will be carried on by the District Representatives under the supervision of the Professor of Field Husbandry. The comparative failure of the crop of alfalfa seed in Ontario during the past two years has greatly retarded the spread of the crop but better results are anticipated in the future.

RESULTS ON THE COLLEGE PLOTS.

In connection with the growing of crops, it is necessary to first take weather conditions into consideration. The following figures show rainfall as recorded at the College for the six growing months:

INCHES OF PRECIPITATION DURING THE SIX GROWING MONTHS.

Months	1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1908.	1909.	1910.	1911.	1912.	1913.	Average fourteen years.
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
April.	1.69	2.24	2.43	2.69	2.10	1.82	1.44	1.66	1.33	3.60	3.13	1.67	1.14	3.53	2.18
May ..	1.03	3.26	1.67	2.44	3.01	3.89	2.71	2.64	3.47	3.43	2.75	1.64	5.64	1.37	2.78
June ..	4.47	1.53	3.06	3.05	2.86	3.24	4.06	1.11	3.21	1.33	.78	.89	1.51	2.03	2.37
July ..	3.05	4.07	6.43	2.67	4.99	4.60	4.65	1.92	3.25	4.54	1.89	1.95	2.53	3.26	3.56
Aug,..	.87	3.51	2.18	3.47	3.88	1.98	2.13	.62	2.75	.89	3.18	2.53	6.07	2.88	2.64
Sept ..	1.52	2.45	3.58	1.48	2.80	2.85	2.49	2.87	.73	.86	3.29	3.42	3.08	1.49	2.35
Totals	12.63	17.06	19.35	15.80	19.64	18.38	17.48	10.82	14.74	14.65	15.02	12.10	19.97	14.56	15.87

It will be noted that 1913 was one of the driest seasons of recent years, just as the preceding season was one of the wettest.

The following are some of the results obtained from the experiments conducted on the College plots:

Experiments show that a mixture of barley and oats will give better results in feeding than either one of these grains when fed alone.

The average yields of crops grown at the College for thirteen years are nearly double the yields of similar crops grown throughout the Province for thirty years.

Thirty varieties of farm crops grown continuously from 19 to 25 years without any change of seed show larger yields in recent years than in the earlier part of this experiment, showing the disadvantage of frequent change of seed, providing care is taken in selection.

Experiments with four varieties of oats over a five year period proved that the maximum yield from large plump seed exceeded those from small plump seed in 90 per cent of the tests.

To kill loose smut of oats and stinking smut of wheat the best results were obtained from grain immersed for twenty minutes in a solution made up of one-half pint of formalin to twenty-one gallons of water.

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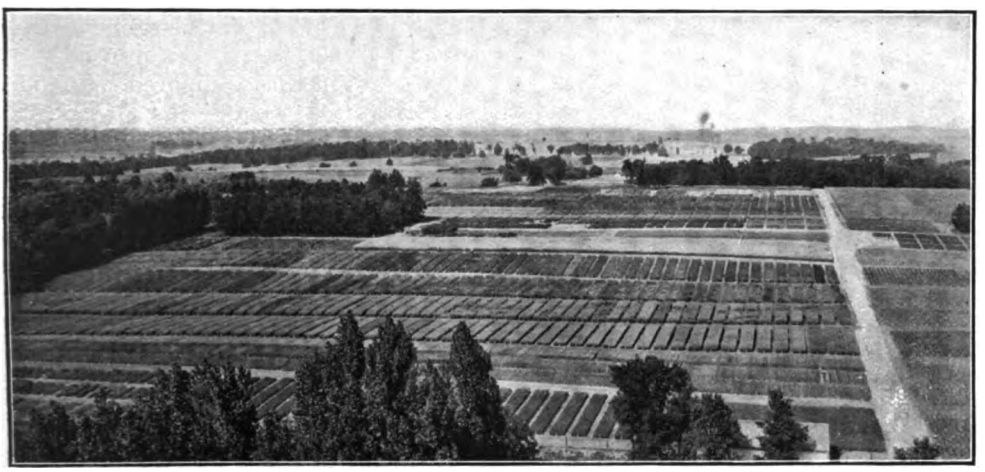
Dawson's Golden Chaff has given the highest yield of grain per acre of fourteen varieties of winter wheat grown at the College in each of the last eighteen years and it is also the most extensively grown variety of winter wheat in Ontario.

Prelude, the new variety of spring wheat originated on the Experimental Farm at Ottawa, was grown on the College plots for the first time last season, and while much earlier than any other variety, was comparatively light, yielding only 23.3 bushels to the acre.

In the work with the pea crop, the Early Britain variety gave the highest yield of grain per acre in the fourteen year test but was slightly surpassed in the



View of one-quarter of the experimental plots, O. A. C.

five year test by No. 20467, a variety obtained from the Department of Agriculture, Washington, but not yet otherwise grown in Ontario.

Pearce's Improved Tree bean gave the highest yield per acre both in the fourteen and the five year tests of field beans.

In potato experiments in the last five years the Extra Early Eureka has made the best record in the early varieties and the Davies Warrior, Empire State and Rural New Yorker No. 2 in the late or general varieties.

CO-OPERATIVE EXPERIMENTS.

The work of co-operative experiments carried on through the Experimental Union is now well-known and continues to increase. The record of this work since its inception is shown by the following figures:

Four Year Periods.	Average Number of Experimenters per annum.
1886–1889	73
1890–1893	557
1894–1897	2,058
1898–1901	3,157
1902–1905	3,533
1906–1909	4,231
1910–1913	4,538

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STRONG CASE FOR LIGHTNING RODS.

For the past thirteen years and especially for the past three years the Physics Department has been making enquiries as to the efficiency of lightning rods as a protection against lightning. A mass of very interesting and important information has now been accumulated and is being issued in bulletin form for handy and general distribution. This information makes out a very strong case in favor of rodding buildings, that is properly rodding buildings. It is based not only on scientific research but on practical experience as well. The following brief facts from the compilation by the Professor of Physics should be carefully studied:

In ten years from 1901 to 1910 reports were received of 599 buildings struck by lightning, 317 or 53.6 per cent. being burned. Amongst the 599, only 18 were rodded and of these only 3 or 16.6 per cent. were burned as compared with 53.6 among unrodded.

From reports of 18 companies covering one-quarter of Ontario it was found that in every 200 farm buildings insured 42 were rodded, and of every 200 farm buildings struck only 3 were rodded. From this is figured an efficiency of 92½ per cent. for rodding.

In Iowa companies reporting over an eight year period showed 50 per cent. of all risks rodded, yet for the whole eight years only $4,464 was paid, an average of $10.15 per company on the rodded buildings, as against $341,065 on unrodded buildings, an average of $775 per company. Note that there were an equal number of buildings in each class and we have an efficiency of 98.7 per cent. for rods.

In Michigan a company insuring only rodded buildings handled risks to the extent of $55,172,075 in four years but paid out only $32 damage to buildings by lightning. Another Michigan company handling both rodded and unrodded buildings and carrying a total risk of $59,567,272 paid out $32,268 on lightning damage in the same four years. This figures out at an efficiency of 99.9 per cent. One company carrying rodded and unrodded classes for the past five years discriminates in favor of the rodded classes by the following rates:

Year	Assessment per $1,000 of Risk	
	Unrodded	Rodded
1909	$2 50	$1 50
1910	3 33	2 50
1911	2 50	1 87½
1912	3 33	2 00
1913	3 33	2 00

During the same five years the assessments of the Protected Company have been:

Year	Assessment per $1,000 of Risk
1909 } 1910 } Together	$2 00
1911	1 30
1912	1 20
1913	2 00

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The average assessment of five companies in Michigan on unrodded buildings is $2.96 per $1,000 risk as against $1.89 on the rodded, a reduction of 36½ per cent on the rodded.

These practical facts supplementing scientific discoveries must prove impressive. It must, however, be strictly borne in mind that buildings must be properly rodded. Too much emphasis cannot be placed on this point.

The whole subject is worthy of the closest attention on the part of Ontario farmers.

'UNDRAINABLE" LANDS DRAINED.

With the purchase of a ditching machine the drainage work carried on by the Physics Department has been broadened during the past year. Practical demonstrations with this machine have been held in several parts of the Province. Especially interesting demonstrations were held in Haldimand County, where it has always been held that the nature of the soil is such that drains would not work. A ten acre field was selected on two farms, one in Walpole and one in Rainham Township. Half of each was drained at different depths and widths and half left undrained for purposes of comparison. Letters received this fall from Albert Snell and Stephen Culver who co-operated in the experiments both state that after recent rains water readily found its way through the clay to the tile and is running freely. It would seem that the drains work, and the future of the experiment will be watched with interest. Further demonstrations were conducted on varying kinds of soil in Bruce, Peterborough, Lennox and Addington, Hastings and Grey Counties. Each was attended by from 75 to 300 interested farmers and the results will be eagerly awaited in future years.

The Physics Department has also carried on the usual work of making drainage surveys and holding demonstrations in the laying of tile. The demand on the department was not quite as heavy as usual, due no doubt to the increasing amount of this work being looked after by the District Representatives. The following table gives the story in brief:

SUMMARY OF SURVEY WORK OF THE DEPARTMENT OF PHYSICS.

Year.	Applications.	Surveys.	Applications held over.	Acres surveyed.	Miles of drain.	Demonstrations.	
						Number.	Average attendance.
1906	15	15	.....	500	45	.....	.....
1907	126	70	56	3,500	350	.....	.....
1908	166	100	66	5,000	510	43	.....
1909	302	179	121	5,157	613	48	18.0
1910	518	383	135	14,672	1,800	132	23.6
1911	414	327	87	15,211	1,864	142	17.4
1912	430	293	137	17,212	2,278	70	21.7
1913	290	247	43	13,705	1,713	56	20.3
	.....	1,614	.....	74,957	9,173	491	.....

Experiments have also been conducted as to the value of cement tile. These tile have been used on the College farm and the conclusion has been reached that cement tile properly made and properly cured should prove durable in soils not acid or alkaline.

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INCREASED INTEREST IN SOILS.

Important work has been undertaken by the Chemistry Department with reference to the soils of the province. Information has been gathered as to the extent and nature of swampy and peaty areas which may be made productive for truck gardening purposes. All these districts have been visited and samples taken for analysis with a view to later demonstrating deficiencies and the best methods of making them productive.

The general work of the Department in making analyses of various kinds during the past year was as follows:—

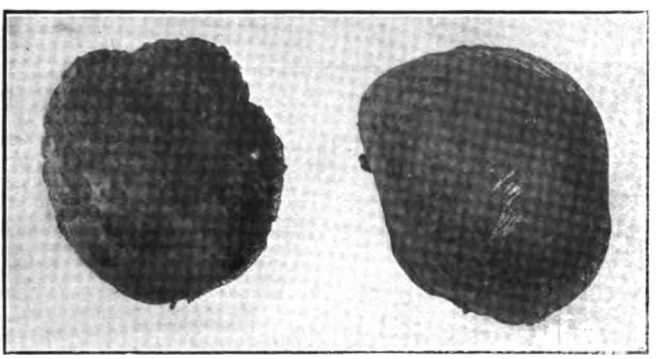
Soils	89	samples
Fertilizing materials	87	"
Cattle feeds	30	"
Human foods	10	"
Water	19	"
Insecticides and fungicides	11	"
Dairy products	20	"
Miscellaneous	24	"
Total	240	

In addition, 163 samples of flour and 50 samples of wheat have been tested for millers and bakers. These showed that flour from 1913 Ontario winter wheat was much superior to that of 1912.

Several samples of water from farm and rural school wells were tested, showing again a large percentage unfit for human use.

POWDERY SCAB OF POTATOES.

One of the new diseases brought to the attention of the Department of Botany during the past year was Powdery or Corky Scab of Potatoes. It was first found in Canada in 1912 by H. T. Gussow, Dominion Botanist, Ottawa, and a few cases have been found in Ontario as well as in other Provinces. It is thought that the spread of this serious disease has been checked. This Department is co-operating with the Dominion authorities, for the matter is one which vitally affects local interests as well as export trade. Any person finding potatoes suspected of the disease should communicate at once with the Department. It is described as follows by the Professor of Botany:—



Powdery scab on potatoes.

"Tubers attacked by Powdery Scab become covered with conspicuous scab spots which are more clearly defined, more elevated and smoother on the surface than the scab spots of common potato scab. A very characteristic greenish, dark powder may also usually be observed on the surface of the spots. In severe cases tubers may be much stunted and malformed, and are frequently gnarled and knobby and covered with deep scars."

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Another serious disease reported to the Department for the first time is known as Club Root. It is regarded as a serious disease and attacks cabbages, cauliflowers, turnips, radishes and kale. It affects the roots and produces knob-like swellings and prevents the tops from growing. If the roots finally rot, the disease gets into the soil. Every effort should be made to prevent its spread in the Province.

CO-OPERATIVE WORK ON WEEDS.

The Department of Botany has recently started co-operative work in determining the best methods of exterminating weeds, and during the past two seasons some twenty-nine farmers co-operated in this work, including six district representatives. Summarizing the reports received, it is found that four men tried experiment No. 1, The Use of Rape in the Destruction of Perennial Sow Thistle; three found the method entirely successful; one only partly successful. Five men tried experiment No. 3, The Use of Rape in the Destruction of Twitch Grass: four reported complete success, one only partial success. Five men tried experiment No. 4, A Method of Cultivation and Cropping for the Extermination of Twitch Grass; three secured satisfactory results, two found the method not completely satisfactory. None, however, had completed the experiment when they had made their reports. Two men tried experiment No. 5, A Method for the Eradication of Bladder Campion; both reported success with this method. Twelve men tried experiment No. 6, Spraying with Iron Sulphate to Destroy Mustard in Cereal Crops; all reported that they found that this method gave good results. A full account of these co-operative experiments will be found in the reports of the Ontario Agricultural Experimental Union for 1912 and 1913.

SEED INOCULATION BRINGS RESULTS.

The Bacteriological Department continued the distribution of cultures of legume bacteria, but the demand was not so great during the past season, doubtless owing to the difficulty of securing good alfalfa seed. Altogether 3,154 cultures were called for, divided as follows: Alfalfa, 2,446; red clover, 461; other legumes, 247. The distribution of alfalfa was divided among the different provinces as follows: Ontario, 1,696; Alberta, 131; British Columbia, 240; Saskatchewan, 168; other provinces and foreign countries, 211.

Blank forms were forwarded with the inoculation in each case and users asked to report results. Returns received show inoculation to have been beneficial in 68.3 per cent. of cases. These cultures are sold at a nominal price, only twenty-five cents being charged for sufficient to inoculate seed for three acres, and should be widely taken advantage of. In some states across the line it is sold by commercial firms, in some instances as high as $2.00 being charged for sufficient for an acre.

DANDELIONS DESTROYED BY SPRAYING

Dandelions have long been a source of great nuisance, especially in towns and cities. Considerable success has been attained in experiments at the College with a view to destroying them by spraying with a solution of iron sulphate. The following account as given by the Professor of Botany will be of interest:—

Spudding dandelions from the lawn is a laborious and unprofitable task. Some easier and more effective method has long been looked for. During the past three years the Department of Botany has been trying experiments in spraying with a

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solution of iron sulphate to kill the dandelions in the lawn. The results obtained are much more promising than those secured by other experimenters in the United States. Last year's results are summarized below.

Only last year's results are cited, but those of the two previous years are very similar though the data are not so exact. In last year's trials a twenty per cent. solution of iron sulphate was used. This was prepared by dissolving two pounds of iron sulphate in each gallon of water. This solution was applied with a knapsack sprayer in the form of a fine spray just after the first few dandelions in the plots came into flower. Forty-eight hours after the application of the solution the leaves of the dandelions were found to be blackened and burned. The burned and withered leaves were raked off and the plots left for about two weeks, when the dandelions were seen to be sending up new leaves. Another spraying was then given with the same results. A careful watch was kept on the plots and it was found necessary to spray them six times during the season in order to prevent the leaves getting a start.

This spring the plots were closely observed and the results of last year's sprayings noted. Each plot contained 168 square feet. The dandelions in these sprayed plots and in the unsprayed check plots were counted: In plot No. 1 there were 130 dandelions; in plot No. 2, 141 dandelions; and in plot No. 3, 91; in the check plot (unsprayed) there were approximately 8,400 dandelions. These figures show that over ninety per cent. of the dandelions in the plots were destroyed by spraying six times with a twenty per cent. solution of iron sulphate.

In these experiments no permanent harm was done to the grass. It looked blackened and discolored just after the spraying, but in a few days was as green as ever. This spring the grass was greener and more luxuriant on the sprayed plots than on the unsprayed plots. It was, however, noticeable that the White Dutch Clover had almost entirely disappeared from the sprayed plots.

This summer last year's experiment was repeated on a larger scale. One-eighth of an acre in which dandelions were very thick was sprayed six times with a twenty per cent. iron sulphate solution. An Aspinwall power potato sprayer fitted with a broadcast attachment was used to apply the mixture. In order to do the spraying very thoroughly it was found necessary to drive slowly and to go over the ground twice at each spraying. Forty pounds of iron sulphate to twenty gallons of water were used at each application. After the sixth spraying the few odd dandelions that continued to send up leaves were sprayed twice with a knapsack sprayer. The results so far are very satisfactory. At least ninety per cent. of the dandelions have been destroyed and the grass has not been injured to any extent beyond the destruction of the White Dutch Clover which is quickly killed by the iron sulphate. The sprayed area looked greener during the summer than the rest of the campus.

It should be mentioned that other experimenters both in the United States and Canada have not found iron sulphate satisfactory for the destruction of dandelions, but the results obtained by this Department during the past three years warrant giving it a trial on lawns that are badly infested with dandelions. Prepare a twenty per cent. solution of iron sulphate by dissolving two pounds of iron sulphate in each gallon of water. Apply this solution with a hand sprayer or a watering can with a very fine rose, so that all the dandelions are thoroughly drenched with the solution. Rake off the blackened leaves two or three days after spraying and in dry weather, if possible, thoroughly water the lawn. Spray frequently enough during the season to prevent the dandelion leaves getting a start.

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Six applications at least will be necessary. Next season in order to fill up the space caused by the destruction of the dandelions re-seed with pure lawn grass seed. Prepare the lawn for re-seeding by raking it over with a coarse rake so as to stir up the soil. Sow the seed when the ground is moist, rake it in well and roll. There is nothing like a good thick stand of grass to keep out dandelions and other weeds.

Spraying with iron sulphate is not very expensive. The iron sulphate may be obtained retail for two or three cents a pound or wholesale at one cent a pound. Forty pounds of iron sulphate, costing wholesale one cent a pound, will make twenty gallons of the solution, which is enough to spray at least one-eighth of an acre, so that if a lawn this size is sprayed six times during the season the cost for the material will be only $2.40, if the iron sulphate is purchased wholesale.

Group of Public School inspectors and teachers getting agricultural instruction and inspiration.

RURAL EDUCATION CONFERENCE.

The lines of usefulness for the College are being extended year by year, and the past summer saw an important extension when for the first time a rural educational conference was held within its doors and campus. This was held under the direction of the Professor of Nature Study, who is also Director of Elementary Education for the Department of Education. It occupied one week and was attended by eighty public school inspectors from as many constituencies throughout the province. It constituted a Short Course for School Inspectors and marked the close of the first Summer School for High School Science Masters, which took up altogether about five weeks. There were also present the teachers, numbering 129, in attendance at the usual Summer School for Public School teachers. The result was a notable gathering of men and women vitally interested in rural elementary education. Appropriate addresses were delivered by competent speakers and every facility was afforded to bring those present in touch with the teachings, experiments and methods of the College. The result cannot fail to be

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a renewed and intelligent interest in giving an agricultural emphasis to teachings in rural schools.

IN THE INTERESTS OF BEE-KEEPERS.

Bee-keeping has shown a very awakened interest, and there has been a steady increase in the demand for information as to the most profitable methods of handling apiaries as well as the best ways of combatting disease. The work of inspection as well as instruction has been directed largely by the Lecturer in Apiculture, who is also now secretary of the Ontario Bee-keepers' Association. A great deal of work has been done by correspondence, there being now 8,000 addresses on the mailing list of those who are understood to be keeping bees. The Short Course at the College attracted an attendance of 70 from all sections of the province.

Demonstrating foul brood in bees.

Aside from this, 59 demonstrations were held during the season in 35 counties, attracting a total attendance of 1,839, or an average of 32 each. The detection and treatment of foul brood and other matters of interest were fully discussed at these gatherings and the best methods of treatment were demonstrated. The work of inspection was also prosecuted vigorously, 1,000 visits being made. Disease, however, was found at only 352 of these places, and in view of the fact that the places visited were those suspected of having disease, the percentage is not large. Altogether 6,786 colonies were inspected, and it was found necessary to destroy only 171 of these.

The bee-keepers are taking up the question of co-operation and marketing as being the next step in the furtherance of their best interests.

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ONTARIO VETERINARY COLLEGE.

The College opened this year with a small increase of students over that of last year, the total number of students attending was also on the increase, there being 373 students this year against 363 last year. They came principally from the following countries in the order named: Canada, United States, Great Britain and other countries. It is interesting to note the gradual increase in attendance from this province since the College was taken over by the Provincial Government, to wit, in 1908, which year the College was taken over, 49 students registered from Ontario; 1909, 69 students; 1910, 74 students; 1911, 83 students; 1912, 85 students; 1913, 96 students.

The increasing demand for special veterinary training regarding the surgical and medical treatment of fur-bearing and wild animals in captivity led to the institution of a short course in the foregoing subject, and illustrated lectures were given by a veterinarian who has had many years experience in probably the largest zoological institution in North America.

During the year the College celebrated the fiftieth anniversary of its founding, thus marking an era in veterinary education in this country. Before another College term opens it is expected the splendid new building being erected on University Avenue will be ready for occupation

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BUREAU OF INDUSTRIES.

One of the strong evidences of the increase in interest in better agriculture is the big demand for publications containing the latest information on agricultural subjects, especially publications issued in concise bulletin form. In addition to distributing copies of Bulletins issued in former years, the following new Bulletins were issued during the past year:—

*187	The Codling Moth	12,000
*188	Weeds of Ontario	12,000
207	Ice Cold Storage on the Farm	12,000
208	Farm Poultry and Egg Marketing Conditions	15,000
209	Farm Forestry	6,000
210	Strawberry Culture and the Red Raspberry	12,000
211	Fruits Recommended for Planting in Various Parts of Ontario	12,000
212	An Orchard Survey of Dundas, Stormont and Glengarry	5,000
213	Bee Diseases in Ontario	15,000
214	Sheep Raising in Ontario—Does it Pay	25,000
215	Demonstration Lectures in Domestic Science (Foods and Cooking), Sewing and Home Nursing	8,000
216	Box-Packing of Apples	12,000
217	Farm Poultry Experiments in Poultry Houses and Fattening Chickens	15,000
	Sewing, Darning and Patching (Special Bulletin)	55,000
		216,000

The following Crop and Statistical Bulletins have been distributed: —

Crop Bulletin 113, November, 1912	15,000
Crop Bulletin 114, April, 1913	6,000
Crop Bulletin 115, May, 1913	6,000
Crop Bulletin 116, August, 1913	6,000
Municipal Bulletin No. 7	6,000

The distribution of the Annual Reports has been continued and the following are the figures of the numbers distributed:—

Minister's Report	25,000
The Ontario Agricultural College	28,000
The Experimental Union	28,000
The Ontario Veterinary College	4,000
Agricultural Societies and Field Crop Competitions	20,000
Horticultural Societies	15,000
Vegetable Growers' Associations	8,000
Live Stock Associations	30,000
Farmers' Institutes, 1 and 2	40,000
Women's Institutes, 1 and 2	33,000
Dairymen's Associations	28,000
Entomological Society	3,000
Fruit Growers' Association	5,000
Ontario Corn Growers' Association	6,000
Beekeepers' Association	3,500
Bureau of Industries (Agricultural Statistics)	7,000
Bureau of Industries (Municipal Statistics)	6,500
	290,000

*Second Edition.

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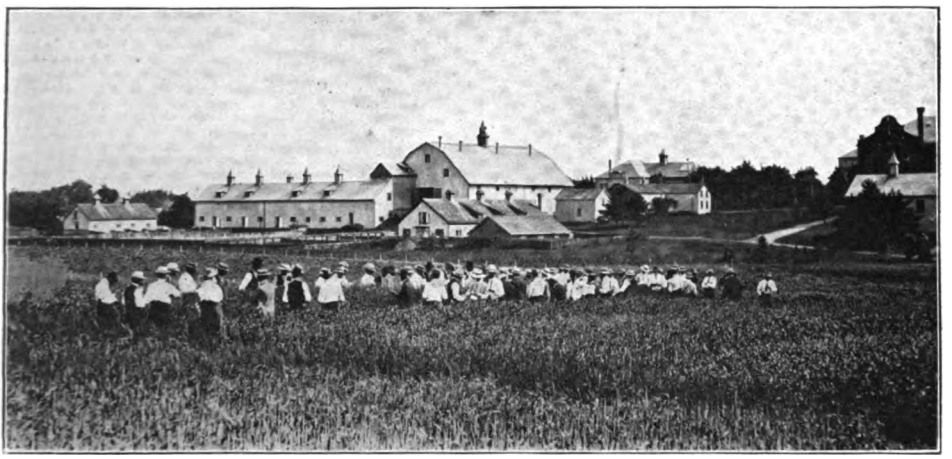
AGRICULTURAL SOCIETIES BRANCH.

The past year has been one of the most successful in the history of the agricultural societies of the province. The exceptionally fine weather which prevailed throughout the entire autumn contributed to this fact very largely. Almost every society reports record attendance as well as splendid competition in the show ring. As a consequence only a few societies were compelled to draw upon the appropriation set aside for insurance against inclement weather. Altogether less than $4,000 was paid out of the $10,000 available.



Field crop judges getting instructions in the fields at O. A. C.

The demand on the Department for expert judges increases year by year, and in order to make this work still more efficient, a new plan was adopted during the past year. A short course of two days was provided for the judges from Western Ontario at the Ontario Agricultural College, Guelph, and for those from Eastern Ontario at the Central Experimental Farm, Ottawa. Competent lecturers from these institutions and elsewhere gave instructions on the different types of live stock and on the best methods of judging standing grain. The idea is to develop among the judges a uniformity of type so that farmers may be correctly advised as to the types to develop in order to succeed either in the show ring or on the market.

FIELD CROP COMPETITION.

Another successful year is recorded in regard to the Field Crop Competitions. The development of this work since its inception in 1907 is shown by the following figures:—

——	Societies.	Competitors.	Acres.
1907	10	325	300
1908	46	650	600
1909	77	1,200	20,000
1910	110	1,650	26,000
1911	104	1,800	28,000
1912	153	3,000	30,000
1913	159	3,500	35,000

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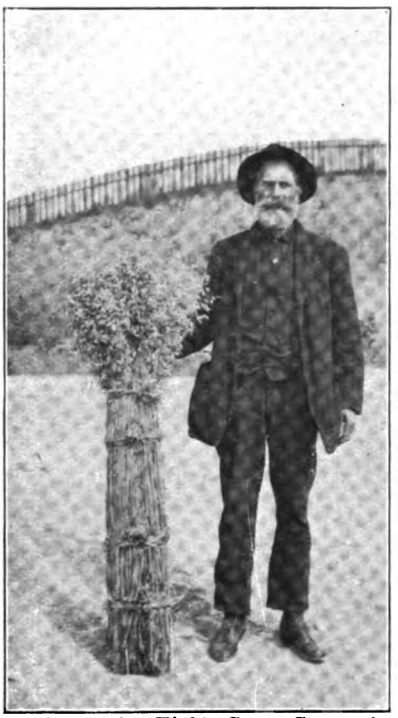
Of the 159 societies, 111 entered in oats, eight in barley, three each in spring and fall wheat, 12 in potatoes, 20 in corn, and one apiece in clover and peas. The grain and sheaves from these competitions exhibited at Toronto and Ottawa Exhibitions and Guelph and Ottawa Winter Fairs were the best since the inception of these competitions and not a single noxious weed was found in any of the grain on exhibition.



Winner in Field Crop Competition with sheaf ready to send to Canadian National Exhibition.

The success attending societies which keep live stock for the use of their members is inducing others to do the same. This will result in improvement in both the quality and quantity of the live stock of these societies.

HORTICULTURAL SOCIETIES.

The good work done by the Horticultural Societies along the lines of civic improvement in cities, towns and villages has had the effect of creating enthusiasm among enterprising men and women in other places to form similar organizations in order to improve the appearance of their own and their neighbour's surroundings. With this end in view the members are supplied with shrubs, plants, flowers and bulbs, and seeds and plants are donated to school children in order to encourage in them while still young a love of flowers and the beautiful. The grounds of hospitals, municipal and other public buildings are also looked after and beds of flowers planted in them, and in some places flowers are sent weekly to patients in hospitals. The number of societies was increased in 1913 and the membership has grown to nearly 14,000. Some societies which had only a very small membership in 1912 had more than 800 members at the close of 1913, St. Thomas Society leading the province with a membership of 1,500.

PLOWING MATCHES.

Very great interest has been taken in the Province in the work of the Ontario Plowmen's Association, which is doing much to encourage interest in that most important feature in connection with the growing of crops, viz., good plowing. The number of branches in 1913 has increased and the membership is increasing in proportion.

A Provincial Plowing Match was held on Mr. Joseph Kilgour's farm near Toronto, which, in spite of the disagreeable weather, was attended by a large number of plowing enthusiasts and the general public, there being entries from many sections of the province. Excellent plowing was done, both in the boys' and adult classes. To enable the plowmen in outlying districts to compete on equal terms with those nearer the place of the holding of the match, the Association paid the expenses on plows and arranged for teams.

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Scene at a plowing match.

Exhibit of vegetabies at Ottawa Exhibition.

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VEGETABLE GROWERS' ASSOCIATION.

This association is doing most valuable work in connection with the growing of the best kinds of vegetables by the most up-to-date methods. One of the principal features during 1913 was the development of co-operative buying by the branches, which resulted in tremendous saving to those who purchased in this way. A co-operative purchasing agent was appointed last year to look after this work, and due to his efforts this method of purchasing has been widely adopted.

The number of branches has considerably increased, and also the membership. Field Crop Competitions were held among the branches in celery, tomatoes and onions, the Province having been divided into districts for this purpose, the branches in a district competing among themselves. The prize winners also exhibited at the Canadian National and Central Canada Exhibitions and the Western Fair. One of the outstanding features of these competitions is that they demonstrate to the growers the varieties best suited to the different sections of the province.

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LIVE STOCK BRANCH.

Great interest has been taken during the past year in the various live stock exhibitions encouraged under this Branch. The large shows held at Guelph and Ottawa evidence marked expansion. The exhibition held at Guelph in December, 1912, showed large increases not only in the attendance and entries but also in the quality of the exhibits. The same is true in a more or less degree of the show held in Ottawa in January, 1913, to serve eastern Ontario.

Aside from these large shows, assistance was given by the Branch to twelve local horse shows and forty-four poultry shows. In connection with these, especially with the latter, much educational work was done, lecturers being supplied to forty poultry shows.

Crowd at a New Ontario Exhibition, Fort William and Port Arthur.

During 1913 the plan which was followed in 1912 of having the cars go on definite dates was again followed. As was expected, this is working out to be a considerable advantage to both buyers in the West and sellers in Ontario, as the breeder when he has an enquiry for stock can state definitely to the prospective purchaser when he will be able to deliver same. This advantage was more fully realized during 1913 than during 1912, and resulted in 12 cars being sent out during the latter year in comparison with 8 during the former year. Cars were sent the first of each month from January to June inclusive and in October and November. The shipments required 2 cars in February, March, April and November, and altogether there were shipped 46 horses, 71 cattle, 107 sheep and 21 swine.

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STALLION ENROLMENT ACT.

A great deal of work was involved in the administration of the new Stallion Enrolment Act which was passed a year ago. Enrolment was compulsory and inspection optional, and a tremendous amount of work was involved in issuing the enrolment and inspection certificates of different grades and in giving information. Although the subject has been discussed throughout the Province for some years and although inspection was advertised in practically every paper in the Province, it was surprising the number who had never heard of it even then. This was true to such a degree that a partial second inspection had to be made to accommodate those who reported that they had never heard of the first inspection. Altogether 2,760 stallions were enrolled. Of these 1,767 were enrolled as purebred and 993 as grades. There were 1,082 inspected, 1,045 being passed and 37 rejected. The different breeds were represented as follows: Clydesdales, 1,179; Percherons, 236; Standard Bred, 156; Shires, 69; Hackney, 59; Thoroughbreds, 31; Belgian, 17; French Coach, 7; German Coach, 6; any other breed, 6; French Canadian, 1.

The first year's administration of the Act has attracted wide attention and awakened a discussion which must be productive of much good. It has also revealed some deficiencies which will have to be adjusted by means of an amendment to the Act. The object of the Act is to place horse breeding on a better footing and the presence of so many grades in the Province, as revealed by the returns, illustrates the need for legislation of this kind. It should be borne in mind, however, that it is impossible to secure maximum returns in the first year of any legislation. The principle of this measure is recognized in almost all the leading States and Provinces on the continent, and if it is given a fair trial in this Province much good should result to the horse industry.

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INSTITUTES BRANCH.

Introducng new features and retaining some of the old features, the work of this Branch has again reached an increasingly large number of farmers throughout the Province. The following figures present the story in brief:

Regular and Supplementary Meetings:

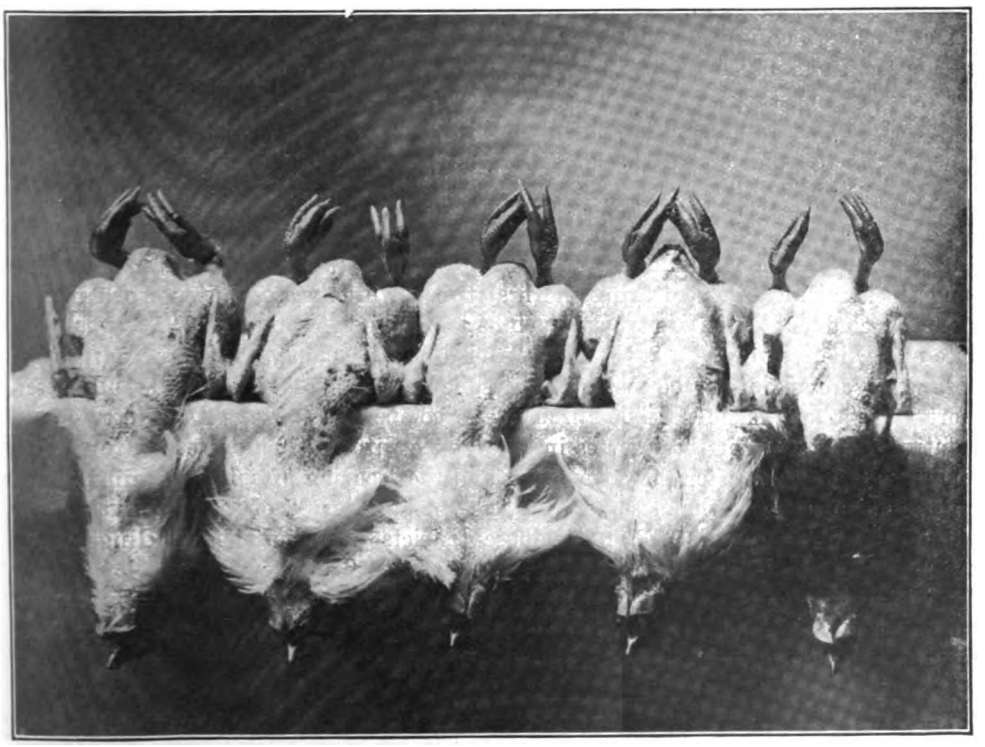
Farmers' Institutes	94,266
Women's Institutes	178,858

Special Institutes:

Women's Institute Demonstration Lectures	22,504
Farmers' and Women's Institute Conventions	14,700
Better Farming Special	11,000
Seed and Live Stock Judging Classes	33,500
Factory and Creamery Meetings	12,931
Total	367,759

BETTER FARMING SPECIAL.

Following the fully equipped train for instruction purposes over the Canadian Pacific lines during the winter of 1912, this Department co-operated with the same



Result of crate fattening.

road in running two cars over their lines from May 26 to July 12, 1913. The method followed was to spend a whole day at each stopping point. This gave the farmers and others interested an opportunity to examine carefully the baggage car

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containing exhibits and illustrative material bearing upon "Purity and High Quality of Seed," "Drainage," "Soil moisture," "Alfalfa," "Insects," "Dairying," "Poultry Raising," "Fruit Growing," etc. The other car contained the following live stock: Percheron mare, Clyde filly, a dual purpose cow, a heifer of good beef type, three dairy cows representing the Ayrshires, Jerseys and Holsteins, three Shropshire and three Cotswold shearlings, three Berkshire and three Yorkshire pigs. Collapsible seats were erected at each stopping point and the stock taken in the open for demonstration purposes. The lectures upon conformation, methods of breeding, feeding, etc., were much appreciated by the farmers. Altogether this feature of work was much appreciated and we believe was quite effective.

FARMERS' CLUBS.

The farmers are coming to appreciate the possibilities and advantages in the organization of local societies, called Farmers' Clubs. The District Representatives of the Department are devoting considerable attention to this feature and are doing what they can to encourage the holding of meetings on the part of the farmers themselves without outside assistance. The policy of the Department is to encourage the farmers in this good work. Speakers were sent to a number of Club meetings and in planning the Institute meetings practically all points where Farmers' Clubs exist were included. Farmers' Clubs and Women's Institutes are in many places holding joint debates, entertainments, social gatherings, etc. There are now considerably over 200 Clubs in the Province. Besides holding regular meetings for the discussion of agricultural problems, the Clubs are taking up the matter of co-operation especially along the following lines: purchase of fertilizers, seeds, feeds, etc., and to a limited extent in the selling of farm produce.

SHORT COURSES IN STOCK AND SEED JUDGING.

This feature of Institute work which grew to such large proportions during 1912 continues to hold an important place in the work of agricultural instruction along stock raising lines. During the first two or three years of this work many were attracted out of curiosity, and, while the attendance during 1913 was not quite up to the record of 1912, there is reason to believe that for the most part only those who were anxious to be instructed attended the courses. Practically all these Short Courses are made possible through the co-operation of the District Representatives, who plan for the Courses in accordance with instructions sent from this Department and look after the advertising and the securing of suitable animals for instruction purposes in the classes advertised. Altogether 88 of these courses were held during the season of 1913 and in those districts where suitable buildings were not available, the Department furnished a tent. The Department has been particularly fortunate in being able to secure first-class men for the work in hand, and much is being done to instil into the minds of the farmers, especially the young men, definite ideals in the work of stock production.

WOMEN'S INSTITUTES.

The Women's Institutes continue to flourish and are attracting much attention as a forceful factor for the betterment of rural conditions. There are now 800 Branches with nearly 25,000 members. The prospects are bright for even more effective work in the near future. In addition to matters pertaining to the comfort, health and intellectual development of the family, the members are devoting a good deal of attention to community problems, such as sanitation in schools, civic improvement, establishment of libraries, aid to philanthropic organization

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and institutions, etc. Recently the Institutes have taken up the question of the need of medical dental school inspection and are making a strong appeal for the introduction of some system which will make this most desirable feature a possibility throughout the whole Province.

DEMONSTRATION LECTURE COURSES.

This feature developed to considerable proportions during 1913, nearly 2,000 people having been served by the courses in "Food Values in Cooking," "Home Nursing" and "Sewing." The women apreciate a systematic course of ten lectures rather than the isolated lecture which characterized the work of the Institute for a number of years, and are quite ready to pay a small fee for this advantage. This line of work promises to become one of the leading features in our Women's Institutes.

DAIRY WORK.

While the past season was not, in some sections of the Province, favorable to a maximum of milk production, the total value of the milk and cream produced in the Province was well up to the average of recent years, and dairying continues to hold one of the leading places in the agriculture of the Province. Though the output of cheese was considerably less than in 1912, there was a considerable increase in the production of butter, while the amount of milk and cream used for household purposes, ice-cream, condensed and milk powder showed a healthy growth.

The weather conditions during the past season were favorable for the production of a high class of dairy products, the amount of exceedingly warm weather, when it is difficult for the farmers to deliver the milk and cream in first-class condition, being quite limited. Prices throughout the season were good, although not quite so high as in 1912. An encouraging feature in our dairying operations has been the marked increase in the production per cow during the past few years, and the farmers are coming to appreciate more fully the wisdom of producing milk in winter months as well as in the summer. A great many silos have been erected during the past season, and the prices for dairy cattle have advanced considerably. The producers are paying more attention to the sanitary conditions of their stables, and are taking better care of the raw products from year to year. All this speaks well for the future of Ontario dairying.

The factorymen are spending large sums in the improvement of factory conditions, especially in making provision for the disposal of sewage.

Much of the advance made, on the part of both the factorymen and the producers, is the result of the large number of factory meetings held from year to year, nearly 250 of these meetings being addressed by dairy instructors during 1913.

The Eastern Dairy School at Kingston continues to play an important part in the betterment of dairy conditions throughout eastern Ontario.

The work of instruction on the part of the thirty-four men who devoted the whole of their time during the manufacturing season to the work of instruction in the factories and creameries in the Province continues to have a marked beneficial influence on the quality of our dairy products. The high standard which characterizes Ontario cheese is being maintained, and gradual improvement in most sections is recorded. Most effective work has been done on the part of the creamery instructors.

Present conditions point to a strong future demand for all classes of dairy products which can be produced in Ontario.

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FRUIT BRANCH.

The two features of the work last season that received special attention were the pruning and packing. For many years now every effort has been made to get the fruit grower and farmer interested in spraying. Splendid results have followed. Enormous quantities of materials and spray pumps are being distributed annually in all sections. Where at one time, a single factory supplied all the needs of the growers, now there are nine companies besides innumerable agencies distributing these goods in this Province. While there is still room for a great deal of work specially in those sections where fruit growing conditions are backward, spraying is now considered to be a necessary operation in every well conducted orchard and one seldom hears the once familiar question—Does spraying pay?

One of the old orchards which receives attention.

PRUNING.

While it has been found that in many cases the fruit is free from disease and insect injury, it has not the color that is so essential to good flavor and the best keeping qualities. Ontario has long been noted for the flavor of all kinds of fruits. To retain that supremacy the highest color possible under our climatic conditions must be secured, and this can be accomplished only by careful pruning. Sunlight is an absolute necessity for color and careful pruning alone will permit of the sun entering all parts of the tree.

By word and by practice, the officers of the Fruit Branch have endeavored to show the growers the best means of handling the closely planted and thickly growing trees which are common to all counties in Ontario. Starting in Lambton

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County early in the spring with a force of twelve men, the Department has visited practically every fruit growing county from west to east as the season advanced. Where conditions warranted it special men were stationed for the full pruning season with instructions to help any person applying for aid. Many meetings were arranged at the request of the growers, while individual applications for assistance were also taken care of as fully as men and money would permit.

In counties where the growers were more than usually interested, orchards were selected for demonstration purposes as in previous years, the work being carried on jointly by the Fruit Branch and the District Representative. In some instances special appropriations were made by the municipalities to help defray part of the expenses. In Lambton County, the council voted $250.00 for the purchase of spraying outfits to operate in orchards selected and pruned by the officers of the Department. Outside of the district officers and their assistants, twenty-two men were engaged and ten thousand dollars was expended during the season in the demonstration work. The following Counties were visited at different times: Huron, Lambton, Essex, Kent, Elgin, Middlesex, Brant, Haldimand, Welland, York, Simcoe, Waterloo, Ontario, Northumberland, Durham, Prince Edward, Hastings, Leeds, Dundas, Glengarry.

The results obtained in a four acre orchard are given below:

GOVERNMENT DEMONSTRATION ORCHARD.

1913.

Expenditures.		*Receipts*	
To pruning, 45 days at $2.00	$90 00	By 120 boxes No. 1 apples at $1.45	$174 00
" spraying 3 times, 6 days, 4 men at $2.00	48 00	By 340 boxes No. 1 apples at $1.40	476 00
" spray materials	35 75	By 4 boxes No. 2 apples at $1.00	4 00
" horse for spraying	4 20	By 30 boxes culls apples at 25c.	7 50
" experimental spraying, 1¾ days, 2 men at $2.00	7 00	By 4 bbls. apples at $2.75	11 00
" horse for spraying	1 20	By profit on sale of pears (odd trees)	25 00
" spray material	5 15		
" ½ day team and man ploughing	1 50		
" cultivating, ½ day	1 50		
" mowing grass twice	3 00		
" thinning fruit, 30 trees	9 00		
" 464 boxes at 20c.	92 80		
" wrapping and lining paper at 4c. per box	18 56		
" picking and packing at 10c. per box	46 40		
" hauling, 2 days at $3.00	6 00		
" 4 bbls. at 50c., picking and packing at 30c.	3 20		
" selling 464 boxes at 8c.	37 12		
	$410 38		
Net profits	$287 12		
	$697 50		$697 50

NOTE.—The above orchard contains 160 trees, twelve of which are 4 or 5 years old. The remainder, twenty of which had little or no fruit on, are 20 to 25 years old.

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WORK IN THE NURSERIES AND ORCHARDS.

The appointment of a Provincial Entomologist during the year has resulted in a great improvement in the conditions of the orchards and nurseries, particularly in the Niagara Peninsula. The staff of inspectors was reorganized and increased, sixteen men being employed during the season. Four million trees were examined for San José Scale, all infested stock being destroyed. The nurserymen offered every assistance in their power with the result that certificates were issued in every case giving them a clear bill of health for the fall shipments. All nursery stock was fumigated under the personal supervision of the staff of the Department as an extra precaution. In addition the orchards surrounding the nursery premises were closely examined and where the trees were found infested, the owners were compelled to cut down and burn or to spray them thoroughly with lime sulphur.

Great progress has been made in spraying in the past few years in Old Ontario.

Eighteen of the municipalities appointed local inspectors under the Fruit Pest Act, twenty-eight men being employed in examining the trees in the orchards for Scale, Yellows and Little Peach. The amount of money spent by these municipalities was $3,000.00, half of which was refunded by the Government Altogether about $10,000 was spent by the Department of Agriculture in this work.

The much dreaded diseases of the peach, the Yellows and Little Peach which two years ago destroyed over 50,000 trees in the Niagara District, are now practically under control. In 1913, 5,800 trees were marked by our inspectors for destruction. With the growers, the municipalities and the Department continuing their co-operation in fighting these diseases, there should be little danger of their becoming serious again in the Niagara Peach Belt.

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ONTARIO FRUIT WINS NOTABLE VICTORIES.

Despite one of the worst seasons this Province has experienced for many years in regard to both quantity and quality of its apples, Ontario was able to more than hold its own at the Exhibitions during the year. The President's cup, the coveted trophy offered by the International Apple Shippers' Association for competition at their Annual Meeting held last year in Cleveland, was won by the exhibit put up by the Fruit Branch of this Department. Winning the blue ribbon in its class against the competition of New York, Pennsylvania and the New England States, the exhibit was finally placed first by the judges for the sweepstakes against all comers, beating the splendid exhibit of West Virginia.

The Canada Land and Apple Show, the first of its kind in the West, was held in Winnipeg during October, 1913. The opportunity was given to all of

Display of Ontario apples which won one of the three notable victories of Ontario apples this year. This was at Cleveland.

the Provinces to exhibit the best of their grains, vegetables and fruits. While the products of Quebec and the Maritime Provinces were missing, the others put up splendid displays that made the Show truly Canadian, and worthy of a leading place among the Winter Exhibitions. Ontario more than held her own in the competitions, winning first and second prizes for the best five boxes of apples, third for the best five boxes of pears and first for the best general display of all fruits, including peaches, pears, plums, grapes and apples. In addition, Kenora won third place in District displays of grains, grasses and vegetables. Competition was very keen in all sections, particularly in boxed apples, and our Western friends were much surprised to get beaten in putting up fruit in this package which they claim is particularly their own product. In view of the bad reports of our Ontario pack in the West, these awards were of great value from an advertising standpoint.

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Later in the year, at the meeting of the New York State Fruit Growers' Association, Ontario won the first prize for the best three boxes of apples in the Show, competition open to all States and Provinces on the continent. Western apples offered serious competition, but the award came again to our fruit. The score for the three leading exhibits are given below. It will be noted that Ontario leads in color and freedom from blemish, two points in which the Western fruit grower always claims superiority.

Exhibit.		Washington.	New York.	Ontario.
Form	10	10	10	10
Size	10	10	10	10
Color	20	19½	19	20
Quality	15	15	15	15
Blemish	20	18½	19¼	19½
Box	5	5	5	5
Bulge	5	4¼	4½	4½
Alignment	5	4½	4¼	5
Compact	5	4½	5	4¾
Style	5	5	3½	4
		96¼	96	97¾

To retain the reputation gained by these events, it is essential that growers and packers alike should guard carefully the grade and quality of fruit sent out from the Province. Without doubt the box package is quickly gaining favor among the shippers, and should be encouraged in every way as it requires much closer attention to the sizing of the fruit and creates a greater pride in the product sent out.

Working along these lines, the Department carried on during the winter twenty-three packing schools covering all of the fruit growing counties. The attendance and interest shown in the work particularly by the younger men was a good indication of the change which will take place in the class of packages used for the best grades of our apples. Preparation will be made to continue and enlarge upon this line of educational work during the season of 1914.

CO-OPERATION ADVANCING.

Activity was shown by the fruit growers in the co-operative handling of their product and this Branch of Agriculture undoubtedly now leads in organization in this Province. Quite an increase was shown in the number of associations and a beginning made in amalgamating the selling forces of the local companies. The Co-operative Fruit Growers of Ontario, Limited, a stock company working on co-operative principles and composed entirely of members of fruit shipping associations, carried on a business of over $78,000. This Association should become very useful under proper management in developing the co-operative handling of fruit and other produce, a subject which has received a great deal of attention and encouragement from this Department. Fruit sold through co-operative associations invariably brought higher prices than that sold otherwise, and higher prices are essential if careful handling is to be encouraged.

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ADVERTISING ONTARIO IN THE WEST.

"Buy from Ontario what you cannot produce yourself" was the slogan sent out to the people of the Prairie Provinces from Old Ontario during the summer of 1913. Taking advantage of the 6,000 mile trip planned for the "Made-in-Canada" train throughout Manitoba, Alberta and Saskatchewan, the Department of Agriculture filled half a car with the best of our fruits together with honey, cheese and butter and sent it out in charge of two of its officials to show the people of the West that nowhere can they find a better place to buy these products than in Ontario. Tens of thousands of visitors saw this splendid exhibit in the 200 towns at which the train stopped and nothing in the entire train proved more attractive. Undoubtedly the value of this exhibit was much greater than those heretofore shown at summer fairs in the big centres in the West.

Following up the visit of this train, several hundred dollars were spent in advertising Ontario fruits throughout the West in the leading agricultural and city papers. Numerous inquiries were received from all parts of the Provinces for the names of shipping firms and associations, and business was created which should lead to further shipments to their markets during the coming season. During 1912, Ontario shipped about 238,000 barrels of apples west, or about 48 per cent. of the total imports. The 1913 figures are not yet known. In tender fruits, the trade is growing steadily, the one Co-operative Company alone in the past season shipping there one hundred and seventy-eight carloads, containing 423,320 packages of grapes, peaches, pears and plums. This probably represents only about half the entire shipment of tender fruits from this Province, chiefly from the Niagara district. When it is remembered that less than ten years ago the first experimental car of tender fruit in cold storage was sent West, it will be seen that the development has been remarkable.

HORTICULTURAL EXPERIMENT STATION.

During the past season some two acres of land was prepared for irrigation tests under the Skinner System in both fruits and vegetables. The growers of the district are very much interested in this work, and it is hoped to start the experiments this spring. To furnish the necessary supply of water the pumping plant was enlarged and is now sufficient to meet the requirements for this and other purposes. Plant breeding has been given an increasing amount of attention with the result that there is now on the farm strawberry seedlings, 12,416. In addition out of the 3,000 seedlings which have fruited for two years, ten have been retained as worthy of extended trial. Peaches, 1,040 seedlings with several thousand pits from crosses for next season's plants. In addition from previous year's plants eight crosses have been selected as having desirable qualities. Grapes, several thousand seeds are now in the greenhouses in preparation for planting. In addition there have been set out this year thousands of seeds of plums, pears, cherries, raspberries, gooseberries and tomatoes. The number of pollenations made in the different fruits was 21,879. It is expected that quite a large percentage of the farm lands will be set out in seedlings during the coming season. This is the most important work demanded of the Station by the fruit growers, but the results must necessarily be slow on account of the time required to bring the trees and plants into bearing.

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Through the Bureau of Plant Introduction of the United States, 109 new fruits were obtained for testing in Ontario. Samples of some recent introductions of fruits, particularly grapes, cherries and plums, were procured from New York and Germany.

In the vegetable department seed selection work was carried on with tomatoes, asparagus and rhubarb. Experiments were also carried on with American and European varieties of peas to determine the most satisfactory varieties and methods of handling for truck growers in this Province.

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DISTRICT REPRESENTATIVES.

It is very gratifying to note the increasing popularity of the work of the District Representatives throughout the Province. Farmers and business men alike are becoming more and more each year appreciative of the value of having in their midst one to whom they can refer for information—practical and scientific—on all questions relating to agriculture. When this work was first introduced in 1906, six offices were opened in six different counties, and to-day we have offices in all but eight counties in the Province, in other words we have established permanent District Representative offices in thirty-seven counties, six of these being added during the past year. The new offices are as follows:—

Haldimand at Cayuga.
Northumberland at Brighton.
Oxford at Woodstock.
Peel at Brampton.
Rainy River at Emo.
Renfrew at Renfrew.

As in former years we have also opened temporary offices for the summer months in the districts of Parry Sound, Sudbury and Kenora.

SCHOOL FALL FAIRS.

There is probably no work undertaken by the District Representatives throughout the Province which has been more successful from every point of view than that of the Rural School Fall Fairs. Three years ago the first one was held in Waterloo County. One year ago they were made a part of the general policy of the Department, and 25 Fairs were held in 12 different counties. In each case the Representative was urged to continue the work, and the effects were so far-reaching that adjoining townships asked to have the fairs held, with the result that last fall there were 69 fairs held in 31 counties, representing 531 schools, a total entry list of 18,652, including poultry, live stock, grain, vegetables and fruit, cooking, sewing and collections of weeds, insects, handy home devices, essays, etc., and an attendance of 33,875, this number including children and parents.

In the early development of the Rural School Fairs little attention was given to organization, and as a result the success or failure of the Fair depended to a very large degree upon the District Representative and the interest taken by the teachers in the various schools. This has been supplemented and the work strengthened to a large degree during the past year by organizing the boys and girls of each district into a Rural School Fair Association, thus placing the movement on a more permanent and satisfactory basis. Early in the spring the District Representative visits the schools and explains to the pupils the work to be undertaken and assists in organization. Each school elects by ballot a Committee of three, whose duty it is to direct the work of the school. The Chairman of this Committee is the school's representative to the Central Fair Board, which is composed of representatives from every school in the district. After all the schools in the district are organized, preferably eight or ten in all, the District Representative calls a meeting of the Fair Board and President, Vice-President, Secretary-Treasurer and Directors are elected. This general Fair Board, under the guidance of the District Representative, has charge of the management of the School Fall Fair of the district. Records are kept of all

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minutes, correspondence, and items of general interest. During the summer they meet together at intervals to discuss matters pertaining to work in connection with the Fair. Among other things the Board is advised to ask the Trustees of each school for a small grant. In some instances, the Township Council has been approached and assistance received in this way. The Treasurer is instructed to open an account in the local bank and pay all accounts and prize money by cheque—in every case special arrangement was made with the bank so that the Board is able to issue cheques for less than $1.00. The cheques are signed by the President and Secretary of the Association, and it is necessary for the winners to endorse the cheques, and in this way the Fair is put on a business basis, and the pupils are in many cases induced to open savings accounts. Not only this,

Board of Directors of a Rural School Fair—the President rises to put the question.

but the meetings are conducted in a businesslike way and the Board is divided into Committees, each in charge of a special department. Entry tickets are printed and each exhibit has its tag; colored prize tickets or ribbons are also printed and placed on the prize exhibits; each officer is supplied with a red printed ribbon to indicate his official position. These and other details, such as providing Directors, with letterheads for correspondence, aid materially in making the Fair of importance to the pupils and causing them to take their responsibility seriously.

As an outcome of the School Fall Fair work, poultry breeding stations have become practically necessary to supply eggs for the Pultry Competition. In supplying eggs to the schools, the object of the Department was to introduce on the farms of the Province a bred-to-lay strain of Barred Rocks which has been

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developed at the Ontario Agricultural College. However, the School Fall Fair movement has developed to such an extent that the College could not begin to supply the demand—last year over 25,000 eggs were supplied by the College, and it will take double this number to meet the demand this coming season. The following plan has been adopted in several counties with great success: The School Fair Board made arrangements with one of the pupils to conduct a breeding station to supply eggs for the Poultry Competition. Pullets of the previous year's Competition were gathered together and suitable male birds selected, making a flock of about 50 birds. The eggs from this flock were distributed among the schools, and the pupils who owned the pullets were paid for the eggs and the pullets returned to the owners after the breeding season. In this way it has become possible to obtain a larger supply of eggs of the proper strain without imposing too much upon the Poultry Department at Guelph.

All this organization work and the work at home in looking after the plots or the poultry has a great educational value. The personal visit of the District

Flocking to the tent containing exhibits at a rural school fair.

Representative or his Assistant during the summer is often helpful to the parents as well as the children. But the Fair Day is a big event. The Fair is held at a convenient school situated as a rule at a crossroads corner away from any town or village. There are no side shows or other distractions. A tent is supplied by the Department and the judging is done by the District Representative, assisted by District Representatives from adjoining counties. It is a general holiday, and the attendance last year ranged from 300 to 1,800 at each Fair. In fact, the whole-hearted way in which the teachers, school trustees and parents generally, have co-operated has been a big factor in making the Fairs so successful both from the social and educational standpoint.

COURSES IN AGRICULTURE.

Too much emphasis cannot be put upon the importance of the Courses in Agriculture conducted in the High Schools under the direction of the District Representatives. Every effort is made to make these Courses as interesting and instructive as possible, special attention being given to the particular class of farming practiced in the district. These Courses vary in length from four to six weeks. The forenoons are devoted to class room work, and when weather permits the students are taken out to nearby farms in the afternoons, where they

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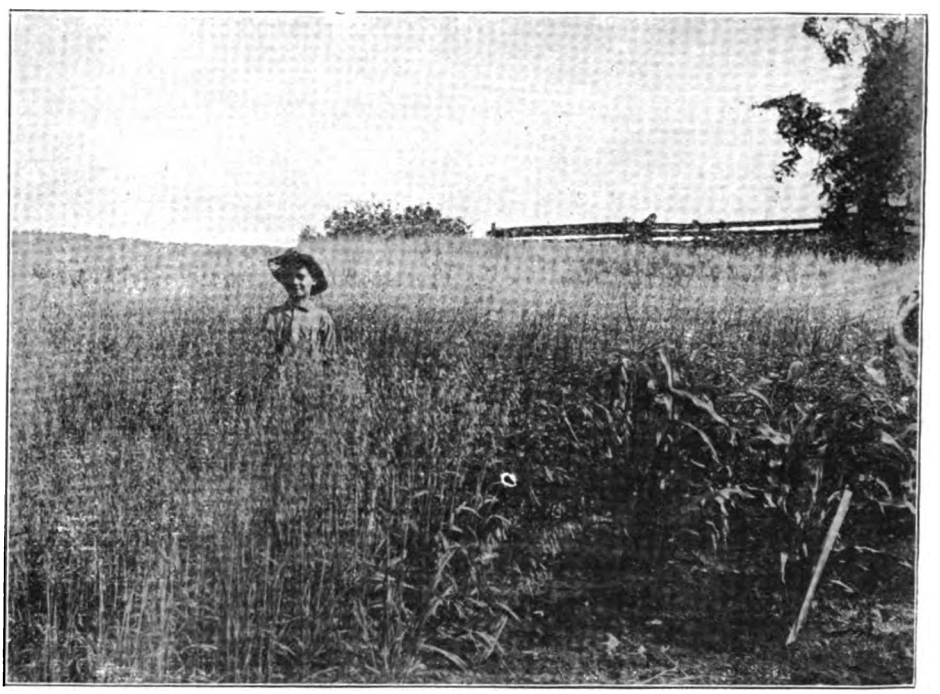
are taught by demonstration the pruning of orchards, judging of live stock, etc. Wherever possible local veterinaries are secured to give lectures on blemishes of horses, and breeders are asked to give short talks on handling. In many instances the Classes have organized Literary Societies for debating purposes. Sixteen of these Courses were held in different counties of the Province during the past year; 346 young farmers ranging in age from fifteen to thirty took advantage of this opportunity for receiving instruction.

PURE SEED CENTRES.

Through the instrumentality of the special courses in weeds and seed selection and farm demonstrations a great deal of interest has been aroused in the selection of pure and better seed. Where a few years ago the farmers were



Rural school fair boy and his plot of oats.

buying their seed corn off the cob from an unknown source, they are now purchasing from reliable growers, and in the large majority of cases insisting on their seed corn being on the cobs and of high germinating power. Realizing the importance of good seed to the farmers of the Province, the District Representatives in co-operation with the officers of the Canadian Seed Growers' Association established pure seed centres in their respective Counties, selecting in each case crops most suitable in that district. The members of these Centres or Clubs are growing pedigreed seed for sale, and have an advantage over the individual doing this work in that one or two members of the Club are growing the special hand selected seed plots and supply the other members with improved seed. This enables the Association to carry on the work just as effectively as the individual could, and on a much more extensive scale. During the past year this work has

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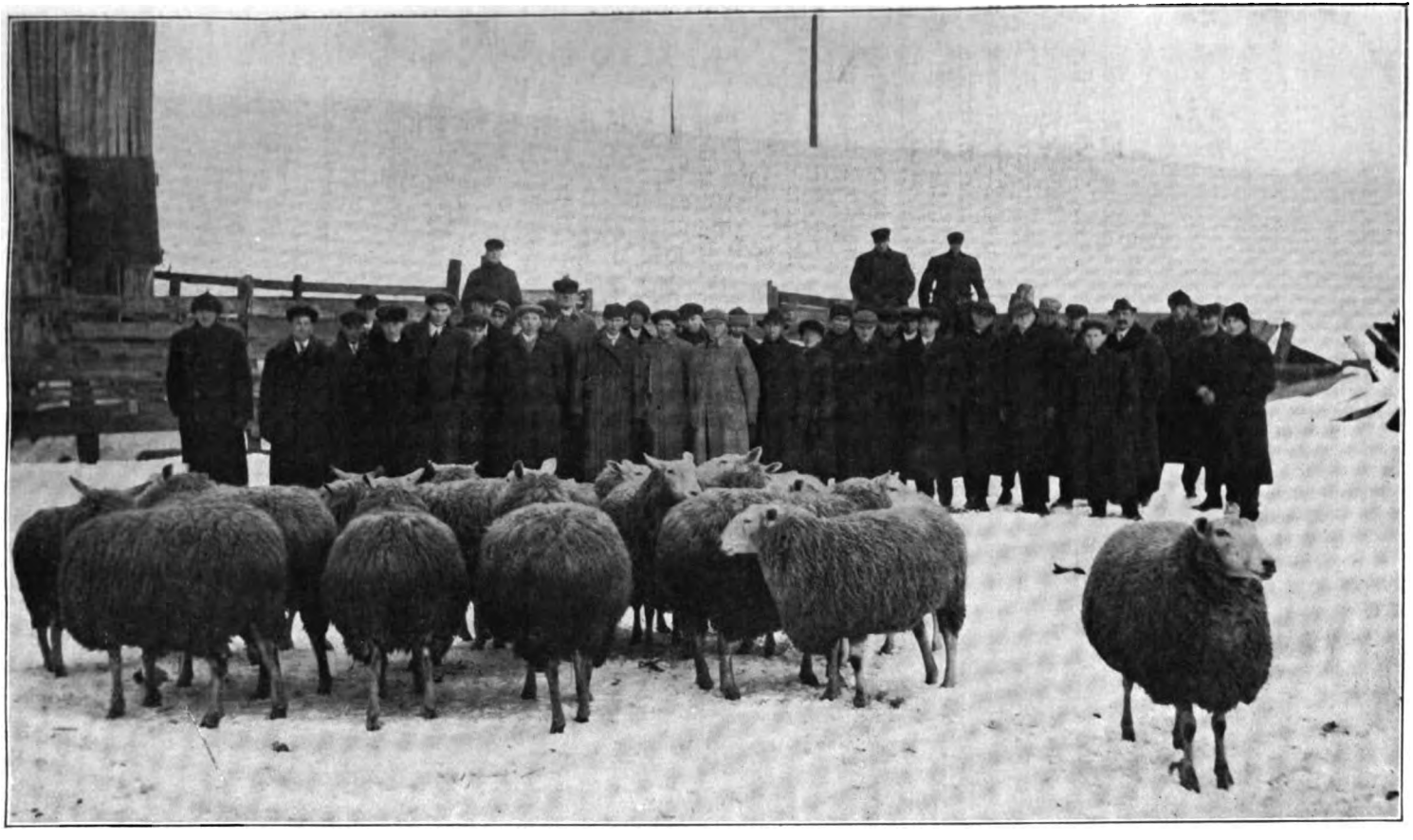

An afternoon session of one of the numerous six weeks' courses held by District Representatives during the winter months.

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been organized in 12 counties, representing 8 Centres in oats, 3 in potatoes, 3 in wheat, 2 in barley and 1 each in alfalfa and clover, making a total of 18 Centres. This work will undoubtedly have a wonderful effect upon increased yields, and I look forward to seeing a large number of these Pure Seed Centres in every County of the Province.

LIVE STOCK BREEDERS' CLUBS.

With a view to encouraging community breeding, District Representatives have devoted considerable attention to organizing the breeders of pure bred stock in various districts for the purposes of conducting meetings to discuss matters relating to feeding and breeding and for the purchase and sale of stock. The first Club known as the Belleville District Holstein Breeders' Club was organized some three years ago, and as a result of the success of this organization 12 Holstein Breeders' Clubs are now in existence in the Province, all proving very successful and doing a great deal toward improving and popularizing this breed of cattle. The first Ayrshire Breeders' Club was organized at Menie, a little later than the Belleville District Club, and there is every indication that the Ayrshire breeders throughout the Province will follow the example set by the breeders in this district. As yet none of the breeders in other classes of live stock have organized but it is hoped that the success attained by these breeders of Ayrshire and Holstein cattle will result in similar organizations for the other breeders of cattle, horses, sheep and swine.

To facilitate the carrying on of this work, each District Representative is preparing a census of the pure bred live stock of his County and arrangements are being made to have this census published in the early fall of each year and put in the hands of each pure bred breeder in the Province. This will make it possible to follow the development of the pure bred industry from year to year, and to study closely the increase or decrease in numbers and quality of the breeding animals in the Province, County, Township or District. It will also make it possible to locate the sections where certain classes of pure bred stock are being bred extensively, and should result in furthering the development of Live Stock Breeders' Clubs throughout the Province.

DRAINAGE SURVEYS.

The benefits derived through underdrainage have been so thoroughly demonstrated during the past few years that little need be said in its defence. It has made possible the bringing into cultivation of tracts of low-lying land which were considered of little value and has converted them into fields which compare favorably with the best in the Province. In many sections where clay land was thought to be too impervious for water drainage, the putting in of drains has resulted in a complete change in the physical texture of the soil, making it more open and porous and increasing its productive power a hundredfold. The District Representatives have conducted 26 drainage demonstrations where farmers were called together and given first hand information in putting in drains after the most approved methods. While the Physics Department of the College has had a large staff making drainage surveys for farmers throughout the Province, the District Representatives, in response to urgent requests, made 342 surveys, covering an area of 8,141 acres, or 25 miles of ditches in 1913.

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CO-OPERATION.

For some years past co-operative buying and selling has attracted the minds of the farmers, but the past year has probably seen a much greater development along co-operative lines than ever before. This can be attributed largely to the influence of the District Representatives through the organization of Farmers' Clubs and other associations which tend to bring the farmers together, thus resulting in the development of a community spirit, or in other words the true co-operative idea. Probably no more striking instance can be cited than the development of the Fruit Growers' Associations throughout the Province. These Associations have been the means of putting the apple growing industry of the Province on a

Exhibits from local offices are features of many fall fairs.

much more substantial basis. Orchards are being much better cared for, the quality of the fruit improved and a more uniform product put upon the market. As a striking example of the expansion of this work Middlesex County might be quoted. When the District Representative for that County was appointed in June, 1912, it could boast of only one Fruit Growers' Association, whereas to-day there are seven Associations, all live organizations and working in the best interests of fruit growing in the County. These Associations have gone a step further and formed themselves into a County Association which will undoubtedly assist materially in furthering the interest already shown in this work. Similar instances might be cited in other counties of the Province.

The organization of Farmers' Clubs has resulted in a much keener appreciation of the value of good seed and it is pleasing to note that practically all the Clubs are making both the purchase and sale of seed a prominent feature of their work. For example, in sections well suited for the production of a certain class of

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seed, the members have been induced to grow seed of a high standard and are selling to Farmers' Clubs in sections where conditions are not so favorable. In this way the farmers are enabled to secure seed direct from the producer and with every assurance as to quality and at a greatly reduced cost. To give some idea of the extent of the work being done in this way I might record the fact that during the past year the Maple Grove Farmers' Club in Waterloo County purchased $800 worth of seed, and the Morrisburg Club in Dundas County purchased 125 bushels of corn on the cob and half a ton of clover seed. Many of the Farmers' Clubs are also buying supplies such as sugar, coal, coal oil, feed, salt, flour and other staple products in car lots. One of the most successful Clubs in this connection is the Williamsburg Club of Dundas County. The total amount of business transacted last year was over $30,000. Other Clubs have been equally successful in the sale of cattle, sheep, hogs, eggs and similar farm products. The Minto Farmers' Club in Hastings County in nine months sold $16,000 worth of stock. The Rainy River Co-operative Potato Growers' Association is deserving of special mention here. This Association started in the spring of 1913 with a membership of 117. At the end of the year the membership was 267. It includes 6 local organizations representing six railway points on the C.N.R. The manager of the Association is working on a five per cent. commission basis, is under bonds for $5.000 and has a line of credit for $2.000. Early in 1913 this Association purchased a carload of seed potatoes from Ohio and the members are making a specialty of growing potatoes for seed. They are also disposing of all their farm products, including hay, grain and all classes of live stock, butter and eggs, through the Association. The Association has done a business of $15,000 during the past six months and it is estimated that the total business for the year will amount to between $30,000 and $40,000. The Chatsworth Marketing Association in Grey County is conducting a business very similar to Rainy River. A central grading station has been established at Chatsworth with a manager in charge and a very successful business is being developed through the retail stores in the City of Toronto. These are a few of the more striking instances which go to show the development of co-operation among the farmers of the Province, and I look for even more rapid development along co-operative lines.

ACRE PROFIT COMPETITION.

The introduction of the Acre Profit Competition through the District Representatives has proved a most valuable and instructive addition to the many lines of work already under their direction. It was carried on for the first time during the past year. Competitions in the past have been held largely with a view toward encouraging better cultivation, eradication of weeds and selection of seed. but no attention whatever was given to the cost of production or the actual net profit per acre. The purpose of this Acre Profit Competition, however, is primarily to show the possibilities of an acre of land from a financial standpoint. This competition was open only to farmers' sons who had attended one of the Short Courses in Agriculture referred to above held by District Representatives. Each county had a separate competition, and there was only one crop grown in each county, and that was decided upon by the competitors themselves. Every effort was made to keep it as near ordinary farm conditions as possible.

In figuring the cost of production $5.00 per acre was allowed for rent of land, 50c. a ton for manure. 10c. an hour for labor of man and 10c. an hour for each

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horse. In addition the actual cost of seed, fertilizer, spraying material, etc., was included. In figuring the profits the following figures were used:

Potatoes, 60c. per bus.
Turnips, 15c. per bus.
Mangels, 15c. per bus.
Corn for silage, $2.75 per ton.
Corn for seed, $1.00 per bus.
Barley, 60c. per bus.
Oats, 30c. per bus.

The results are very much above the average yield for Ontario and go to show very conclusively what may be accomplished as a result of better cultivation of the soil, good seed and intelligent use of fertilizers. I append herewith a tabulated statement of the results in each county.

POTATOES.

		Yield.	Cost Prod.	Profit.
Dufferin	Roy Best, Shelburne	180 bus.	$24.20	$83.80
	Soil, sandy loam, following barley, farmed 50 years, 11 loads manure, 125 lbs. fertilizer, variety American Wonder.			
		Yield.	Cost Prod.	Profit.
Thunder Bay	Arthur Sitch, Hymers	427½ bus.	$25.05	$231.45
	Soil, clay loam, following hay, farmed 5 years. Carman No. 1, from O. A. C., no bugs, matured 4½ months.			
		Yield.	Cost Prod.	Profit.
Parry Sound	Ernest Inch, Burk's Falls	256 bus.	$50.00	$98.90
	Soil, sandy loam, following peas, farmed 20 years, 16 loads manure, White Elephant, Paris Green, 114 days mature.			
		Yield.	Cost Prod.	Profit.
Kenora	Jas. W. Hatch, Dryden	255½ bus.	$50.26	$100.35
	Soil, loam, following oats, farmed 10 years, 14 loads manure, Beauty of Hebron, seed from previous.			
		Yield.	Cost Prod.	Profit.
Welland	Will. Crysler, Allanburg	296 bus.	$42.35	$135.25
	Soil, clay loam, following alfalfa, farmed 75 years, 6 loads manure, 500 lbs. 3-6-10 fertilizer, sprayed Bordeaux twice.			
		Yield.	Cost Prod.	Profit.
Grey	Otto Foy, Rocklyn	197 bus.	$37.90	$80.30
	Soil, clay loam, following oats, farmed 60 years, 16 loads manure, sprayed Paris Green twice, Irish Cobbler.			
		Yield.	Cost Prod.	Profit.
Ontario	Harold T. Lick, Oshawa	198 bus.	$40.78	$73.82
	Soil, clay loam, following oats, 7 loads manure, farmed 75 years, sprayed once Bordeaux, Delaware.			

TURNIPS.

		Yield.	Cost Prod.	Profit.
Algoma	Wm. E. Dickison, Sault Ste. Marie	975 bus.	$42.45	$103.80
	Soil, clay loam, following peas, 20 loads manure, Prize Winner variety, 15c. per bushel.			

MANGELS.

		Yield.	Cost Prod.	Profit.
Durham	E. H. Martyn, Port Hope	537 bus.	$26.70	$53.85
	Soil, sandy loam, following potatoes, 10 loads manure, Ideal Red variety, 15c. per bushel.			
		Yield.	Cost Prod.	Profit.
Northumberland	Nelson Usher, Wicklow	569 bus.	$31.20	$54.15
	Soil, rich clay loam, following corn, 15 loads manure, Ideal Red.			

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CORN FOR SILAGE.

		Yield.	Cost Prod.	Profit.
Prince Edward	Wm. Zufelt, Consecon	19 tons.	$23.40	$28.85

Loam soil, following clover and timothy, farmed 100 years, 3 loads manure, 400 lbs. fertilizer, variety Wisconsin No. 7, $2.75 per ton.

		Yield.	Cost Prod.	Profit.
Simcoe	Stanley Griesbach, Collingwood	19½ tons.	$15.15	$38.47

Soil, clay loam, following oats, farmed 25 years, 9 loads manure, Improved Leeming.

		Yield.	Cost Prod.	Profit.
Brant	Leslie Sanderson, Paris	16 tons.	$19.75	$24.25

Soil, sandy loam, following hay, farmed 70 years, 12 loads manure, Comptons Early.

		Yield.	Cost Prod.	Profit.
Norfolk	Truman Charter, Tyrrell	18½ tons.	$19.50	$31.37

Soil, light loam, following hay, farmed 60 years, 12 loads manure, Wisconsin No. 7.

		Yield.	Cost Prod.	Profit.
Manitoulin	Arthur Wickett, Meldrum Bay	15 tons.	$18.52	$22.73

Soil, sandy loam, following potatoes, farmed 32 years, 10 loads manure, Improved Leeming.

		Yield.	Cost Prod.	Profit.
Victoria	Howard W. Hardy, Oakwood	18 tons.	$21.12	$28.38

Soil, clay, following fall wheat, farmed 45 years, 10 loads manure, Longfellow.

CORN FOR SEED.

		Yield.	Cost Prod.	Profit.
Essex	Jas. Halford, Maidstone	107.52 bus.	$19.80	$87.73

Soil, sandy loam, following tobacco, farmed 3 years, no manure, White Cap variety, $1.00 per bushel.

		Yield.	Cost Prod.	Profit.
Lambton	Hugh Cameron, Inwood	82.16 bus.	$25.78	56.38

Soil, clay loam, following wheat, farmed 15 years, 12 loads manure, 500 lbs. fertilizer, White Cap.

BARLEY.

		Yield.	Cost Prod.	Profit.
Lennox & Addington	Ross Frisken, Napanee	55 bus.	$11.70	$21.30

Soil, clay loam, following potatoes, farmed 3 years, no manure, variety O.A.C. No. 21, 60c. per bushel.

		Yield.	Cost Prod.	Profit.
Dundas	Wm. J. Fawcett, Inkerman	56 bus.	$13.80	$19.80

Soil, clay, following oats, farmed 25 years, no manure, O.A.C. No. 21.

OATS.

		Yield.	Cost Prod.	Profit.
Middlesex	Loftus O. Muxlow, Strathroy	89 bus.	$12.74	$17.52

Soil, clay loam, following potatoes, farmed 60 years, variety Siberian, 34c. per bushel.

		Yield.	Cost Prod.	Profit.
Glengarry	Harvey Paresien, Cornwall	57 bus.	$17.10	$2.28

Soil, clay, following oats, farmed 3 years, 7 loads manure, Banner.

		Yield.	Cost Prod.	Profit.
York	Clarence W. Marchant, Lloydtown	82½ bus.	$9.45	$18.60

Soil, clay loam, following potatoes, farmed 80 years, no manure, Newmarket.

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		Yield.	Cost Prod.	Profit.
Carleton	H. Washington Graham, Huntley	77 bus.	$10.70	$15.50

Soil, clay, following hoed crop, farmed 50 years, no manure, Banner.

		Yield.	Cost Prod.	Profit.
Lanark	J. W. Norman Poole, Perth	72 bus.	$12.90	$11.59

Soil, clay loam, following corn, farmed 50 years, Banner.

		Yield.	Cost Prod.	Profit.
Bruce	Jas. Scott, Walkerton	81 bus. 23 lbs.	$11.54	$16.23

Soil, loam, following potatoes, farmed 27 years, Banner.

Not the least feature of the competition was the nature of the prize awarded to the contestant showing the greatest net profit per acre in each county. The winners, twenty-five in all, were sent to the Ontario Agricultural College to attend a Two Weeks Course in Live Stock and Seed Judging, the entire expense being borne by the Department. So successful has the competition been not only from the standpoint of securing valuable data on cost of production and profit per acre for growing various crops, but also from the standpoint of the valuable instruction imparted to the young farmers who participated, that the Department through the District Representatives feel justified in continuing the competition from year to year.

FRUIT WORK.

As in the past, District Representatives in co-operation with the Fruit Branch have done a great deal to encourage fruit growing in many sections in the Province. Sixty spraying and pruning demonstrations have been conducted with an attendance of from fifteen to seventy-five farmers at each one. These meetings were made as practical as possible and were usually held in an orchard, where, after the demonstration by the instructor, those in attendance were given an opportunity to assist in the pruning, thus gaining invaluable knowledge in a very practical way. In the same way practical instruction in the mixing and applying of spraying materials was given. The interest aroused by these meetings is very largely due to the demonstration orchards conducted for a term of years under the direction of the District Representatives. These orchards have been conducted in fifteen different counties, as many as four orchards being cared for in one county, and in every case with very valuable results. As a rule the orchards selected are from twenty to forty years old and have been almost totally neglected as to pruning, cultivation, fertilization and spraying. The following statement of results from an orchard which has been under the care of a District Representative for three years goes to show most conclusively the profit which may be derived from the proper care of an orchard:

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Approximately 2½ acres, light sandy loam; 117 trees, 32 years old.

	In neglected state.			After cared for.		
	1908	1909	1910	1911	1912	1913
				$ c.	$ c.	$ c.
Scraping				11 25		
Pruning				34 00	22 00	39 00
Painting wounds				10 28	7 05	
Gathering brush				6 75	4 00	4 50
Cementing holes in trees					1 25	
Bracing trees with wire					1 37	
Removing dead wood and thinning suckers					90	1 80
Spraying:						
First				25 90	21 90	20 55
Second				15 75	15 70	13 13
Third				23 17	23 35	15 60
Fertilizer:						
Manure				25 00	30 00	30 00
Muriate of potash, 500 lbs.				13 00	11 70	12 60
Acid phosphate, 1,000 lbs.				11 00	11 00	16 00
Applying				1 00	1 00	1 00
Freight						2 75
Cultivation				7 50	18 00	5 70
Total expenses				202 60	178 22	174 63
Expenses per acre				81 04	71 29	69 85
Yield in barrels	300	250	73	331	333½	234
Receipts from sale	$300 00	$300 00	$100 00	$740 55	$449 80	$495 59
Per cent. No. 1's	30–60	30–60	30–60	87.6	80.5	82.5
Net profit				$537 95	$271 58	$318 95
Net profit per acre				$215 18	$108 63	$127 58

While every encouragement is given to the production of more and better fruit, the necessity for a more uniform grading of fruit is not being overlooked and the importance of an attractive package has been emphasized. The barrel has for many years been the popular package for shipping apples, but is being gradually superseded by the box where first-class fruit is being packed. District Representatives have rendered valuable assistance in encouraging the use of the box for shipping apples, through conducting demonstrations in co-operation with the Fruit Branch, special attention being given to grading and the various packs.

POULTRY.

In many sections of the Province the raising of poultry is of considerable importance and the revenue from dressed poultry forms no small part of the total revenue from Ontario farms. To emphasize this fact. it is interesting to note that over $30,000 worth of poultry was sold in one day at Napanee. It is equally true, however, that too little attention is being given to the selection of breeds for this purpose and proper fattening. In many instances birds are taken off the range in a very thin condition and as a result do not command very satisfactory prices. Here again the District Representative has been instrumental in putting this industry on a more satisfactory basis by conducting crate fattening demonstrations. The figures below show the results of a crate fattening experiment:

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Fattening Ration:

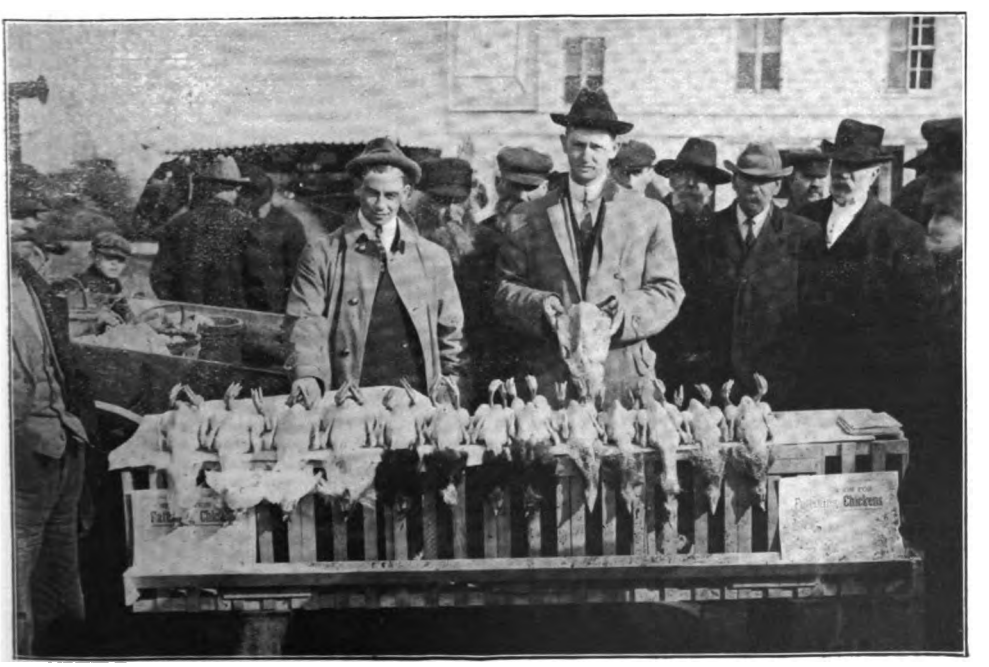
25 lbs. low grade flour.
25 " oats with hull removed.
25 " finely ground buckwheat.
Creamery buttermilk.

Barred Rocks: 6 birds, fed 12 days.

Weight, 27½ lbs at 14c.	$3 85
22½ lbs. grain mixture at 1½c.	33
40 lbs. buttermilk at 40c. per cwt.	16
Total cost	$4 34
Weight plucked, 32½ lbs.	
Gain in weight, 5 lbs.	
32½ lbs. at 18c.	$5 85
Total cost	4 34
Profit	$1 51
Profit per bird	25

Buff Orpingtons: 5 birds, fed 17 days.

Weight, 19 lbs. at 15c.	$2 85
26 lbs. grain mixture at 1¼c.	33
60 lbs. buttermilk at 40c. per cwt.	24
Total cost	$3 42
Weight plucked, 23½ lbs.	
Gain in weight, 4½ lbs.	
23½ lbs. at 18c.	$4 23
Total cost	3 42
Profit	$0 81
Profit per bird	16



Demonstration in the crate fattening of poultry.

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White Wyandottes: 4 birds, fed 16 days.

Weight, 14 lbs. at 14c.	$1 95
19 lbs. grain mixture at 1½c.	29
30 lbs. buttermilk at 40c. per cwt.	12
Total cost	$2 36
Weight plucked, 19 lbs.	
Gain in weight, 5 lbs.	
18 lbs. (heads removed) at 18c.	$3 24
Total cost	2 36
Profit	$0 88
Profit per bird	22

White Leghorns: 4 birds, fed 16 days.

Weight, 11½ lbs. at 14c.	$1 61
16 lbs. grain mixture at 1½c.	25
30 lbs. buttermilk at 40c. per cwt.	12
Total cost	$1 98
Weight plucked, 14 lbs.	
Gain in weight, 2½ lbs.	
12¾ lbs. (heads removed) at 17c.	$2 17
Total cost	1 98
Profit	$0 19
Profit per bird	04¾

Black Minorcas: 4 birds, fed 16 days.

Weight, 14 lbs. at 14c.	$1 96
15¾ lbs. grain mixture at 1½c.	24
30 lbs. buttermilk at 40c. per cwt.	12
Total cost	$2 32
Weight plucked, 16 lbs.	
Gain in weight, 2 lbs.	
14¾ lbs. (heads removed) at 17c.	$2 50
Total cost	2 32
Profit	$0 18
Profit per bird	04½

The weights at which purchased were for birds right off the range, and the price paid is 2c. per pound more than was being paid by the largest local shippers to the Gunn's plant at Harriston.

The price allowed for buttermilk, 40c. per cwt., is excessive, as is also $1.50 per cwt. for the ground feed, which was at that time worth $1.30 per cwt. at the mills. These prices were charged for the convenience of small quantities for our purpose delivered.

The dressed fowl were sold at the prices offered for them by the local retail butchers who disposed of some of the birds to their customers at 22c. per pound.

It will be noted from the above results that there is a marked difference in the suitability of the different breeds for fattening purposes, and also substantial profits from crate fattening.

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WIDE RANGE OF WORK.

While these are some of the more recently developed features, it must be borne in mind that the district representatives have, in continuing the work of previous years, accomplished many other things that stand for better agriculture. Publicity associations have been organized in several counties which have done much to stimulate an interest and help the farmers to realize the advantages of their own district as well as attract capital from without the county. These associations have also been instrumental in materially assisting in the solving of the labor problem.

Special meetings relating to all phases of agriculture have been held. Cow Testing Associations have been assisted, grain of the best varieties distributed, fertilizer experiments conducted, Farmers' Clubs organized. Farm forestry has been undertaken in many sections. The following summary of the work done in one office during the year will give some idea of the extent of the work:—

Callers at office	2,220
Letters sent out	1,378
Letters received	1,432
Circular letters sent out	1,714
Drainage surveys	14
Acres surveyed	700
Miles tile drainage completed	30
1 Fall Fair exhibit	3,000
2 Farmers' Institutes	100
4 Special meetings addressed by Dist. Repr.	232
4 Box Apple Packing Demonstrations	57
4 Pruning Demonstrations	86
2 Apiary Demonstrations	55
1 Short Course	22
4 Rural School Fall Fairs	2,900
2 Fruit Institutes	160
1 Poultry Convention	150
Special Seed Centre	40

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MONTEITH DEMONSTRATION FARM.

In many respects the past year has been an eventful one in the history of this farm. The results of the work done are of much value, and at the same time the farm has made a start at its larger sphere of usefulness in exercising an influence on the agricultural conditions of the district.

On July 31st the first Farmers' Picnic or Short Course was held at the farm in order that the farmers might have an opportunity of seeing for themselves the work which was being carried on and have brought to them the best information available that would assist them in dealing with their own problems. The T. & N.O. Railway co-operated by giving a very cheap excursion rate, and the excursion was under the auspices of the Englehart Agricultural Society. Over 1,500 people were present from all sections between New Liskeard and Cochrane. Addresses were delivered by several prominent public men and also by experts from the Ontario Agricultural College, who had come up for that special purpose. Those present showed the very keenest interest in all the information given, and each of the experts was kept busy replying to questions which showed at once the intelligence and enterprise of the farmers as well as their appreciation of the information. It is hoped to make this an annual event, so that the farmers of the district may have an opportunity of visiting this farm, as the farmers of Old Ontario have of visiting the College at Guelph from year to year.

In the matter of crop production about forty-eight acres were utilized. The season was very cold and backward and this mitigated against the success of the crops, particularly the crop of fall wheat, peas, potatoes and turnips.

Twenty-five acres north of the railway, which had been previously logged and burned, were seeded to a mixture of red and alsike clover. This area was sown as an experiment and the results obtained were not sufficiently satisfactory to warrant the general adoption of the practice. On areas which had been burned quite clear or "muck," the "catch" was fairly good, but where there was any quantity of "muck" present, there was practically no indication of growth.

Two acres of alfalfa, which had been seeded in the summer of 1912, wintered without any appreciable loss. Not a plant could be found that had suffered from winter injury. While the early part of the season was quite unfavorable, this king of forage crops grew luxuriantly. It was cut for the first time on the 16th of July, and on the 3rd of September a second cutting was obtained. Both cuttings were cured in excellent shape and made a welcome addition to the store of winter feed for the stock.

About the middle of July the hay crop was cut and stored. Of the fourteen acres of hay, five acres were first crop clover and the remainder second crop clover and timothy. The cold backward spring caused the yield to be much lighter than that of former years, scarcely reaching a ton and a quarter to the acre. During the first week in September a second cutting was obtained from the five acres of first crop clover. This cutting was successfully cured and stored, an operation which is generally very difficult at this season of the year in Temiskaming.

Eight acres were sown with barley (O.A.C. No. 21) on the 20th of May. This crop proved quite satisfactory, although it suffered considerably from drought about the first of July. It was harvested on the 6th of September and should yield about 35 bushels to the acre. Two acres on which peas had been sown the previous year and plowed under gave excellent results.

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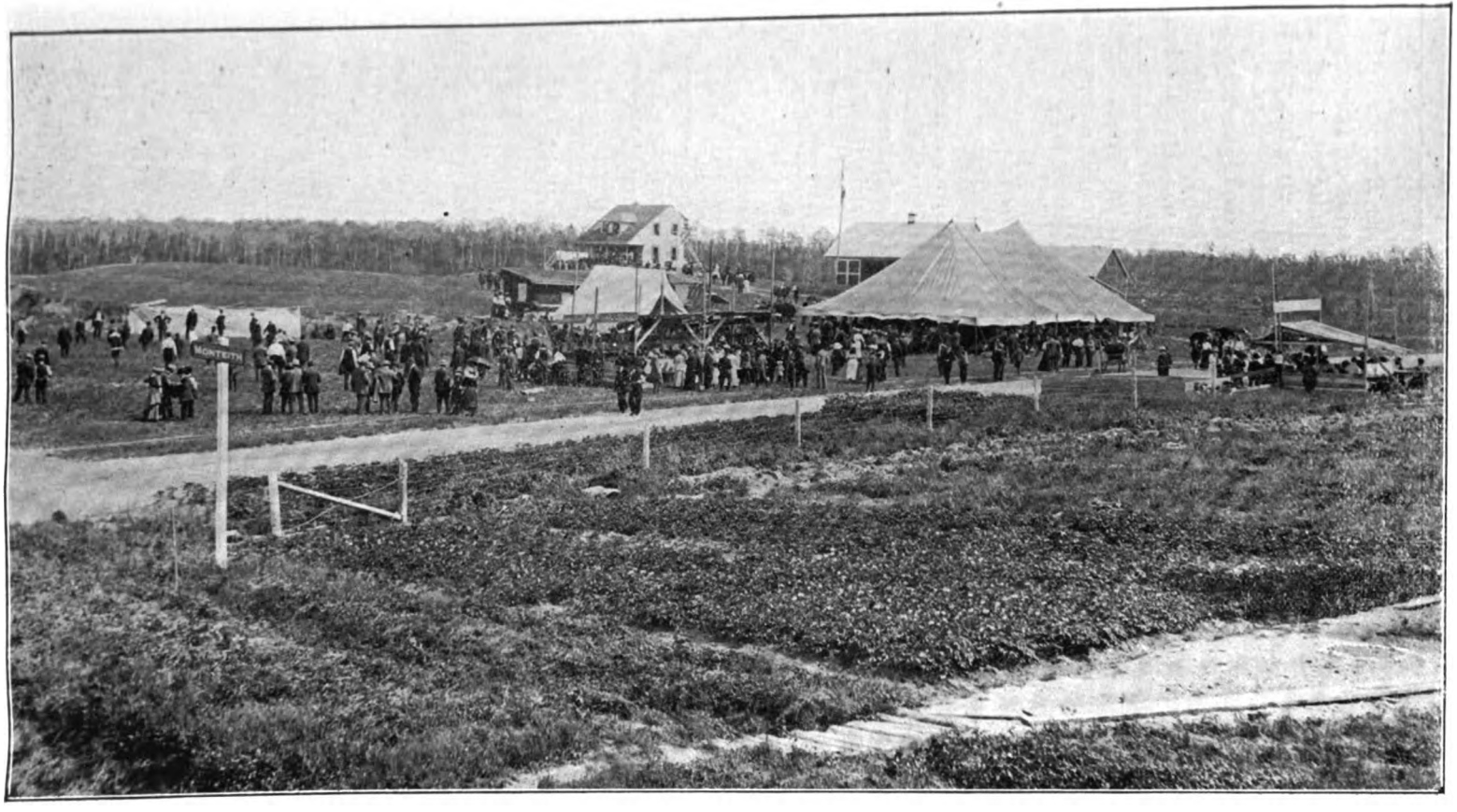

First excursion of farmers of New Ontario to Demonstration Farm at Monteith.

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During the last week in May eighteen acres of oats (Banner Regenerated) were sown. This land had not been previously cropped and five acres of it was covered with about three inches of muck or partially decayed organic matter. The "mucky" area suffered a severe frost, which cut off the crop entirely when the plants were about three inches high. This did not kill the oats, however, and they soon grew again, but the crop was delayed about three weeks and was consequently affected by the frost again before it was thoroughly matured. The remainder of the eighteen acres, although sown at the same time, was not affected by the frost because it was free from an excess of muck, which, as is well known, retains a much larger percentage of moisture and is consequently more susceptible to frost. The oats were harvested on the 10th and 11th of September and should average about forty bushels to the acre.

PURE-BRED STOCK AND UNDERDRAINAGE.

A number of notable additions have been made to the farm in the live stock department. Two purebred Shorthorn cows were purchased and have already shown very creditable records. One produced 6,792 lbs. of milk with a butter fat test of 4.6 per cent., and the other 5,846 lbs. of milk with a butter fat test of 5 per cent. during the period of one year from the date of calving. In addition they produced a splendid calf each. As both are males they will be utilized for distribution to Live Stock Improvement Associations in order to improve the live stock of the district in general. In addition to the purebred Clydesdale mares, a number of purebred Barred Rock poultry and two colonies of bees have been added to the stock of the farm.

Some very valuable work was also done in underdrainage, five acres being underdrained with tile. In the short time which elapsed before the frost set in the drains worked exceptionally well. On two acres of this land fall wheat was sown and the crop grew very rapidly, with the result that an excellent covering was obtained before the winter.

In addition, a new house has been erected which adds considerably to the appearance as well as to the accommodation.

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COLONIZATION AND IMMIGRATION.

It is gratifying to report an exceptionally successful year in the efforts of this branch to meet the demands for farm labor. The following figures represent the records of the office for the year:—

Number of farm laborers placed on farms by Bureau of Colonization ..	3,927
Number of farm laborers placed on farms by Salvation Army	783
Number of other immigrants brought to Ontario by Salvation Army	2,755
Number of domestics placed by Salvation Army	480
Number of domestics given twenty-four hours accommodation at the Women's Welcome Hostel and placed by them	1,501
Number of domestics placed by other agents	1,557
	11,003

There is no doubt but that there was a large number of others of whom no record could be secured, but who were influenced to come to Ontario by means

Advertising Ontario products in London, England.

of the work of this branch in Great Britain and elsewhere. These figures, however, show an increase of approximately 1,400 in the number of farm laborers placed directly by this Bureau. Another gratifying feature has been the large number placed on yearly engagements. I have frequently pointed out that one of the chief difficulties in the farm labor problem has been that so many men were employed only for six or eight months. Over a year ago we sent out a circular urging farmers to plan their work in such a way as would enable them to employ a man the year round. It is satisfactory to note that 75 per cent. of the applications now being received are for men on yearly engagements. Furthermore, letters being received daily indicate that, generally speaking, the immigrants have been of a good type and have given reasonable satisfaction.

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Through our office at 163, Strand, London, England, an energetic campaign has been carried on in Great Britain and Ireland with a view to making Ontario better known. Extensive newspaper advertising, lecturing and personal interviews have all been adopted, as well as the distribution of thousands of pieces of literature. There can be no doubt that considerable capital, as well as many settlers, has been attracted to the province in this way. Efforts are, of course, confined to farm laborers and domestic servants, to all of whom positions are assured on arrival. The office has also handled the appropriation of $25,000 for assisted passage, no more than $20 being loaned to one person. The collections have been looked after on this side, and of the cases looked after by this Bureau 90 per cent. of the loans have been returned.

NEW ONTARIO.

Every day brings forth enqiries from nearly all parts of the world about New Ontario, a large portion of the enquiries coming from the Western Provinces. The letters we are receiving from the Prairie Provinces are evidently written on account of the results obtained by friends who have gone from that part of the country and taken up land on the Clay Belt. Co-operating with the T. & N. O. Railway Commission a demonstration car fitted with the products of the soil from all parts of New Ontario and accompanied by competent lecturers was sent on a three months' itinerary of Old Ontario points, so that those who contemplated making a change might see for themselves the possibilities of New Ontario soil. This in itself has attracted wide attention.

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FACTORY INSPECTION BRANCH.

The value of factory inspection is being appreciated more year by year. During the past year I took advantage of several opportunities to personally visit a number of factories to observe conditions.

During the year the staff, which was increased by the addition of a new inspector to look after New Ontario, visited 410 cities, towns and villages, and made 7,348 inspections, covering about 5,084 industries. In the following table is shown the variety of places visited:—

Agricultural Implement Works.	Flax, Twine and Cordage.
Brick, Tile and Cement.	Tobacco.
Cotton.	Woollens.
Clothing.	Bakeshops.
Carriage and Wagon Works	Confectionery.
Chemicals.	Boot and Shoe Stores.
Food.	Drugs.
Glass.	Dry Goods Stores.
House Furnishings.	Fancy Goods Stores.
Metal Founding, etc.	Furniture.
Metal Goods.	General Stores.
Laundries, Chinese and other.	Groceries.
Leather and Leather Goods.	Hardware.
Locomotive and Car Shops.	Jewellery.
Lumber and other Woodworking Trades.	Music, Books and Stationery
Machinery.	Millinery.
Paper and Paper Trades.	Tailoring Establishments.
Rubber and Gutta Percha.	Mineral Water.
Mica.	Other unclassified places.

Four thousand three hundred and eighty-nine recommendations were made dealing with the following subjects: Sanitation, boiler inspection, child labor, fire escapes and other fire protection, guards for machinery and safety of electrical devices, exhaust systems, hours of labor, mode of wearing the hair, and various other orders. Advice has been received that many of these orders have been, or are being complied with. Reasons are sometimes given for not immediately complying with an order given, such as contemplated moves or reconstruction of buildings, and in these cases recommendations are not urged, but allowed to stand pending re-organization.

About 130 special visits were made in connection with previous recommendations; the usual investigations of complaints, accidents, and explosions also took up a portion of the inspectors' time.

The mileage covered by the inspectors during the past ten months was 57,435; this is independent of livery and street car mileage.

It was necessary to resort to the courts in a few cases, and fourteen prosecutions were instituted; in each case conviction was recorded and fines imposed, as follows:—

Walker & Sons, Walkerville, for violation of child labor law. Conviction. Parents of both children also fined for allowing their sons to work contrary to the Act. Each fined $1 and costs.

Mrs. Griffin, London, for violation of the child labor law, fined $1 and costs.

Five Chinamen (St. Thomas) Sam Wah, Lee Sing, Jim Lee, Charles Pang and Lou Poi, for non-compliance with the regulation regarding sleeping and eating apartments being separate from laundry. Each fined $2. Three of these were again prosecuted for continued violation.

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Lee York and W. W. Pang, Amherstburg, for non-compliance with regulation regarding sleeping and eating apartments, fined respectively $5 and costs and $1 and costs.

Five boiler and one gas explosion was reported, with, in two cases, serious results. These were investigated and causes were as given below:

In the saw mill of James W. Arbuthnot, Northfield Station, explosion was caused by key having dropped out of stay bolts in dome. No one injured.

In the Riverdale Garage & Rubber Co.'s plant, Toronto, a small gas boiler exploded; cause, excessive steam pressure. No one injured.

In the saw mill of Manley Chew, Midland, explosion was due to over-taxing an old boiler. Two men killed and others injured.

At the City Gas Co.'s plant in Oshawa, explosion was due to over-taxing an old boiler. Two men were killed.

In the saw mill of H. R. Lawson, Stewarton, boiler exploded, but no one was injured.

In the Watson Manufacturing Plant, at Ayr, explosion of gas took place, with the result that three men were injured. A leak in the plant partly filled the gas house with fumes and a workman lit a match before all the gas had escaped.

One hundred and forty-six regular overtime permits were issued during the past ten months, and 47 special bake shop permits, which is a decrease in regular permits, but an increase in special bake shop permits, 19 of which were issued in 1912.

In view of the great amount of electric power used and the danger of accidents from that source, the Department issued, through the courtesy of the National Electric Light Co., of New York, about 7,000 "Resuscitation Cards," which were sent out to the various industries where electric power is used. These cards illustrate the way in which a person who has had an electric shock may be revived, and it is hoped and expected that much good will result.

About 13,000 copies of the revised Factories, Shops and Office Buildings Act were also sent out, and 4,000 Annual Reports distributed.

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STATIONARY ENGINEERS' BOARD.

In connection with issuing certificates to all engineers operating engines of 50 h.p. or more, or 20 pounds pressure or more, the past year has shown another increase. Altogether the Board examined 1,138 candidates. bringing the total number of certificated engineers up to nearly 8,000. There are many evidences that the Act is being very well observed. In fact the Act has worked so satisfactorily that the hoisting engineers have made requests to me to be included on similar terms, and this matter will receive careful attention.

All of which is respectfully submitted,

JAMES S. DUFF,
Minister of Agriculture.

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THIRTY-NINTH ANNUAL REPORT

OF THE

Ontario Agricultural College

AND

Experimental Farm

1913

(PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE, TORONTO)

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To His Honour SIR JOHN MORISON GIBSON, Knight Commander of the Most Distinguished Order of St. Michael and St. George, a Colonel in the Militia of Canada, etc., etc., etc.

Lieutenant-Governor of the Province of Ontario.

MAY IT PLEASE YOUR HONOUR:

The undersigned begs to present for the consideration of Your Honour the Report of the Ontario Agricultural College and Experimental Farm for 1913.

Respectfully submitted,

JAMES S. DUFF,

Minister of Agriculture.

Toronto, 1914.

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THE ONTARIO AGRICULTURAL COLLEGE, GUELPH

HON. JAMES S. DUFF, *Minister of Agriculture, Toronto.*

FACULTY OF INSTRUCTION, 1913-1914.

(All, except the President, arranged in order of Seniority.)

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J. HUGO REED, V.S. ..... Professor of Veterinary Science
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MISS BELLE MILLAR ..... Demonstrator in Butter Making and Soft Cheese Making
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R. W. BROWN, B.S.A. ..... Demonstrator in Dairy Husbandry
S. R. CURZON ..... Fellow in Chemistry
N. CURTIS ..... Instructor in English and Resident Master
D. W. GILLIES ..... Instructor in Athletics

S. SPRINGER ..... Bursar and Superintendent
S. H. GANDIER, B.S.A. ..... Secretary
MISS J. GARDINER ..... Librarian
MISS A. O. HALLETT ..... Assistant Librarian
W. O. STEWART, M.D. ..... Physician
MRS. K. FULLER ..... Superintendent, Macdonald Hall
MRS. CUNNINGHAM ..... Matron, Agricultural College

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ONTARIO AGRICULTURAL COLLEGE

AND EXPERIMENTAL FARM

1913

To the Honorable the Minister of Agriculture:

SIR,—I have the honor to submit herewith the thirty-ninth annual report of the Ontario Agricultural College and Experimental Farm, including the report of the Macdonald Institute, for the year 1913.

The following is a brief review of the work contained in this report:—

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Respectfully submitted,

G. C. CREELMAN,

President.

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Ontario Agricultural College.

PART I.

THE PRESIDENT.

The year 1913 marks an epoch in the history of this Institution. Four hundred and forty-seven students were enrolled in September in the long course, two hundred and twenty-five of these being Freshmen. This we take as an indication of the continued popularity of the Institution, due to the work we are able to do for the young men themselves and also for the parents on the farms.

Every Province of the Dominion has representatives in our classes, and in addition men are here from all parts of the world.

Agricultural Education.

The demand for education in agriculture is steadily increasing in our rural districts. Our professors could be in the country all the time holding meetings, delivering addresses and conducting demonstrations in agriculture. Farmers' Institutes, Farmers' Clubs, and the different activities of our Agricultural Representatives with their short courses in agriculture and their longer course in the High Schools and Collegiate Institutes, have given an impetus to agricultural education such as has never been seen before in this country.

Public School Work.

The demand for instruction for teachers is greater than ever. Teachers themselves who have not had such help are writing us continually about short courses in this new field of work and in co-operation with the Department of Education we have been able to handle some hundreds of rural school teachers and give them some instruction and inspiration along the line of agricultural teaching. School gardens are now being started everywhere as a result of this instruction, and the Director of Elementary Agriculture has a busy time visiting the schools, attending Teachers' Conventions and keeping up his correspondence with teachers all over the Province.

Agricultural Representatives.

New Counties were again opened this year by the Government, and new appointments were made to fill the positions. We are enabled to meet the requirements better from year to year, as a number of under-graduates have been serving as Assistant Representatives each summer, and some of them even dropping out to spend a year and a half at this work.

These men are doing uniformly good work; their energy seems tireless and their methods are thoroughly and essentially practical. The farmers are also taking kindly to the work, and seem to appreciate every effort that is put forth for their good. As a matter of fact the farmers hardly realize now how they got along without such a man in previous years. Nearly forty Guelph College graduates are now employed to carry our work to the farmer on his own farm.

The following is a list of the men engaged in District Representative work, together with the counties in which they are located:

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County.	Name.	Location.
Algoma District	Smith, A. S.	Sault Ste. Marie.
Brant	Schuyler, R.	Paris.
Bruce	McKay, N. C.	Walkerton.
Carleton	Jackson, W.	Carp
Dufferin	Dorrance, H. A.	Orangeville.
Dundas	Bradt, E.	Morrisburg.
Durham	Duncan, R. S.	Port Hope.
Elgin	Buchanan, C.	Dutton.
Essex	Edwards, W. E. J.	Essex.
Frontenac	Main, C.	Sydenham.
Glengarry	McRae, D. E.	Alexandria.
Grey	Duff, H. C.	Markdale.
Haldimand	King, H. M.	Cayuga.
Hastings	McIntosh, A. D.	Stirling.
Kent	Johnston, J. T.	Chatham.
Lambton	Bramhill, G. G.	Petrolea.
Lanark	Harding, P. S D.	Perth.
Leeds and Grenville	Smith, W. H.	Athens.
Lennox and Addington	Curran, G. B.	Napanee
Manitoulin Island	Metcalf, I. F.	Gore Bay.
Middlesex	Whale, I. B.	London.
Nipissing District	Galbraith, C. A.	New Liskeard.
Northumberland	Beckett, R. S.	Brighton.
Norfolk	Murray, R. H.	Simcoe.
Ontario	Tipper, R. M	Whitby.
Oxford	Green, R.	Woodstock.
Peel	Tisdale, W. H. J.	Brampton.
Peterboro	McRae, F. C.	Norwood.
Prince Edward	MacVannell, A. P.	Picton.
Rainy River District	McElroy, H. M.	Emo.
Renfrew	Tennant, J. L.	Renfrew.
Simcoe	Laughland, J.	Simcoe.
Thunder Bay District	Collins, G. W.	Fort William.
Victoria	Knight, A. A.	Lindsay.
Waterloo	Hart, F. C.	Galt.
Welland	Austin, R.	Welland.
York	Steckley, J. C.	Newmarket.

Short Courses.

To our surprise, the short courses continue to be largely attended. For older men and men of all ages on the farm whose time and work is needed during most months of the year these short courses seem admirably adapted. While two weeks, or four weeks, or even three months, does not seem to be adequate to teach any subject very fully, yet it is surprising how much interest is displayed and how much enthusiasm is evidenced even in these short courses.

The attendance at these courses in 1913 was as follows:

Three-month Course in Dairying	37
Two-week Course in Stock and Seed Judging	189
Two-week Course in Fruit Raising	104
Four-week Course in Poultry Raising	30
Two-week Course in Bee-Keeping	60
Total	420

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Stock Judging.

At the Winter Fair in Guelph more than one hundred students entered the Stock Judging classes in horses, dairy and beef cattle, sheep and swine.

The following is a list of the prize winners in each class:

Results of Judging Competition, Winter Fair, 1913.

Horses.	*Beef Cattle.*	*Dairy Cattle.*
1. Finn, R. A.	1. Laidlaw, C. M.	1. Foyston, B. E.
2. Johnston, R. S.	2. Miller, J.	2. McKillican, L. W.
3. Varey, J. M.	3. Hogarth, E. G.	3. Hinman, R. B.
4. Abraham, R. H.	4. Allen, J. N.	4. Miller, J.
5. White, W. R.	5. Davis, E.	5. Hare, H. R.
6. McLarty, J. E.	6. (Outsider).	6. Kedey, W. M.
7. Carroll, D. E.	7. Hunter, R.	7. Pawley, N. H.
8. Hodgins, E. L.	8. Mitchell, E. R.	8. White, A. H.
9. Strong, W. F.	9. Jones, M.	9. Mosely, L. A.
10. Winter, M. H.	10. (Outsider).	10. Hopkins, S. H.

Sheep.	*Swine.*
1. Nixon, W. G.	1. Varey, J. M.
2. Carroll, J. A.	2. Steele, J. A.
3. Knapp, J. S.	3. Elgie, R. H.
4. Anderson, J. F.	4. Pope, J. C.
5. Stansfield, N.	5. Murray, R.
6. Kelleher, M.	6. Donaldson, J. R.
7. Curran, H.	7. Robb, O.
8. Foreman, E. C.	8. Campbell, A. M.
9. Forsyth, F.	9. Griffin, R. J.
10. (Outsider).	10. Cotsworth, F. B.

From our Senior Class is selected a team of five men each year to compete in stock judging at the International Live Stock Exposition held in Chicago in December. We do not select our team until just before the show, so that the entire class of Senior students who are taking the Agricultural Option are given thorough instruction and each man a chance to compete for a place on the team until the last moment. This year the team stood sixth, there being thirteen teams in the competition. The following men composed the team:

Brown, J. M., Girvan, Ayrshire, Scotland.
Forsyth, F., Glasgow, Ontario.
McLaurin, A. E., Watson, Sask.
Stark, J. W., Chatham, Ontario.
Woltz, G. L., Hartford, Ontario.

College Work and Progress.

This year has witnessed great building development about the Institution. The dining-room which was mentioned in last report is nearing completion, being a beautiful stone building, just at the west entrance of the College grounds. This will relieve our crowding in many ways, and with the additional space in the way of bed-rooms in the old dining-room, kitchens, and so forth, we hope to make more students comfortable next season.

The Federal Government aid seems to have come just at the right time, and we have been able to erect two very fine college buildings out of this grant. For the Department of Field Husbandry has been erected a beautiful building. It is

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146 feet by 63 feet, built of red pressed brick and covered with red asbestos shingles, and is situated in the garden just below the Horticultural buildings.

In the Poultry Department we have been able to erect a new building for administration and instruction out of the Federal Grant also. This building is 63 feet by 100 feet and will accommodate both long and short course students. When we have removed the old buildings this part of the grounds will appear very much improved. Through the Federal grant we have also been able to help many of the other college activities such as drainage, poultry instruction, analysis of soils and so forth.

The bulletins prepared during the year by members of the staff and published by the Department of Agriculture are as follows:

206. "Dairy School Bulletin (Pt. 2)" by Staff of Dairy School.
207. "Ice Cold Storage on the Farm" by R. R. Graham.
209. "Farm Forestry" by E. J. Zavitz.
213. "Bee Diseases in Ontario" by Morley Pettit.

Macdonald Institute.

Our Women's Department continues to increase in popularity as evidenced by our having to refuse a great number of students each term for want of room.

The work of Macdonald Institute is now being felt generally throughout the Province as well as in the Provinces to the east and west of us. Besides the hundreds of homemakers who are going out there are also dozens of girls taking positions in hospitals as Dietitians, in schools as Teachers of Domestic Science and as Matrons and Housekeepers in public institutions. We seriously believe that the work being done is already telling upon the home life in this Province. The work is practical, methodical and scientific and is tending to systematize women's work in all branches of home making.

Changes in Staff.

In the Department of English, Mr. G. H. Unwin, who was a most excellent lecturer, resigned to take up farming in Alberta. He was succeeded by J. W. Charlesworth, B.A., of the Collegiate Institute staff, Guelph. Mr. Charlesworth is doing good work both in English and in German.

Mr. R. W. Wade, Associate Professor of Animal Husbandry, resigned his position in September to accept the position of Director of the Live Stock Branch of the Department at Toronto. Mr. Wade has been with us a number of years, and we regret losing a man of his character and ability, but we recognize his change as a promotion. We feel we were fortunate in securing as his successor W. R. Reek, B.S.A., a graduate of this institution in the year 1910.

In the Dairy Department Mr. R. W. Brown, a graduate of last year, has been appointed as Demonstrator in Cream Separators and Buttermaking.

STUDENTS OF THE YEAR.

Attendance.

General Course	609
Specialists in General Course Work	9
Manual Training (One Year Normal Course)	5
Teachers' Courses (Agriculture and Horticulture)	17
Dairy Course	37
Stock and Seed Judging	189
Poultry Raising	30
Fruit Growing	104
Apiculture	60
	1.060

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At Macdonald Institute.

Domestic Science	271
Nature Study (78), Elementary Agriculture and Horticulture (44), High School Science Teachers (27), Public School Inspectors (80)	229
	500
Total	1,560

N.B.—There were also 110 children from the Guelph Public Schools who received instruction in Domestic Science at Macdonald Institute.

Analysis of College Roll (General Course), 1913.

From Ontario.

Algoma	7	Huron	10	Peel	5
Brant	26	Kent	8	Perth	8
Bruce	7	Lambton	20	Peterboro	5
Carleton	16	Lanark	3	Prescott	2
Dufferin	7	Leeds	5	Rainy River	2
Dundas	6	Lennox	2	Renfrew	1
Durham	7	Lincoln	16	Russell	2
Elgin	12	Middlesex	22	Simcoe	11
Essex	6	Muskoka	3	Thunder Bay	1
Frontenac	5	New Ontario	1	Victoria	3
Glengarry	3	Nipissing	5	Waterloo	12
Grenville	6	Norfolk	16	Welland	8
Grey	5	Northumberland	13	Wellington	38
Haldimand	7	Ontario	10	Wentworth	18
Halton	7	Oxford	13	York	53
Hastings	3	Parry Sound	3		
				Total from Ontario.	449

From Other Provinces of the Dominion.

Alberta	16	New Brunswick	3	Saskatchewan	10
British Columbia	31	Nova Scotia	12		
Manitoba	7	Quebec	4	Total from other Provinces	83

From Other Countries.

Agentine Republic	1	India	1	South Africa	9
Belgium	1	Japan	1	Panama	1
B. W. I.	1	Mexico	1	Spain	2
England	28	Newfoundland	1	U. S. A.	21
Germany	1	Russia	1		
Ireland	2	Scotland	3	Total from other Countries	75

Ages and Religious Denominations.

The limits of age in the General Course, 1913, ranged from 17 to 41 years. The average age was 22.

Anglican	161	Evang. Association	3	No Religion	1
Baptist	34	Friends	4	Presbyterian	176
Christadelphian	2	Jewish	2	Roman Catholic	25
Christian Scientist	1	Latter Day Saints	2	Unitarian	1
Congregational	8	Lutheran	2	United Brethren	1
Dutch Reform	1	Methodist	185		

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BACHELORS OF THE SCIENCE OF AGRICULTURE, 1913.

Beckett, R. S., South Pelham, Ont.
Bland, A. G., Kelowna, B.C.
Boddy, R. A., Guelph, Ont.
Bramhill, G. G., Harriston, Ont.
Brown, R. W., Bismark, Ont.
Clemens, R. H., Galt, Ont.
Cooke, H., Johannesburg, S.A.
Culham, G. J., 36 Walmer Rd., Toronto.
Curzon, S. R., Guelph, Ont.
Davies, E., Brantford, Ont.
Davison, W., Willow Point, B.C.
Diaz, R., Ferrol, Spain.
Ellis, G. C., Florence, Ont.
Ferguson, R. H., Guelph, Ont.
Grange, J. B., 115 Madison Ave., Toronto
Harding, P. S. D., Lacombe, Alta.
Henry, L. B., Winona, Ont.
Hextall, L. J., Calgary, Alta.
Hood, E. G., Hagerman, Ont.
Howitt, M. H., 104 George St., Hamilton.
Jenkins, G. J., Todmorden, Ont.
Johnston, S. C., Islington, Ont.
Keegan, H. L., Monkstown, Dublin, Ireland.
King, H. M., Hickson, Ont.
McElroy, H. M., Chesterville, Ont.
McKee, D., Des Moines, Iowa.
Millen, F. E., Sittingbourne, Kent, Eng.
Nicholson, C., Teviotdale, Ont.
Nixon, H. C., St. George, Ont.
Noble, J. W., Horning's Mills, Ont.
Palmer, E. F., Victoria, B.C.
Presant, H. E., Guelph, Ont.
Rogers, C., Johannesburg, S. Africa.
Ryrie, H. S., Oakville, Ont.
Shaver, F. D., Cainsville, Ont.
Sirett, A. W., Rosseau, Ont.
Staniforth, H, Grazelbrook, Man., Eng.
Tennant, J. L., Falkland, Ont.
Tisdale, W. H. J., Paris, Ont.
Tregillus, C. A., Calgary, Alta.
Webster, C. A., Dundas, Ont.
Wilson, G., Oakville, Ont.

RECIPIENTS OF ASSOCIATE DIPLOMAS, 1913.

Amos, L., Guelph, Ont.
Anglin, L., Brewers Mills, Ont.
Batty, E. C., Oshawa, Ont.
Beatty, H. A., Walsh, Alta.
Bertram, L., Dundas, Ont.
Binnington, D. J., Cataraqui, Ont.
Bradshaw, B. O., Burkeville, Va.
Braithwaite, H. A., 99 Charles Street, E., Toronto.
Burrows, A. R., Guelph, Ont.
Burrows, L. F., Guelph, Ont.
Clark, H., Stouffville, Ont.
Cochran, M., Almonte, Ont.
Connon, P. C., Aberdeen, Scotland.
Cory, A., Prince Albert, Sask.
Croskery, W. M., Kinburn, Ont.
Cumming, R. E., South Gower, Ont.
Curtis, N., Simcoe, Ont.
Cuthbertson, J. A., Manion, Ont.
Donald, F. C., Mandaumin, Ont.
Donovan, W. O., St. George, Grenada, B. W. I.
Dow, A. R., Spring Hill, Ont.
Dudgeon, E. R., Morris, Ill.
Edmonds, W. F., Silverwater, Ont.
Elder, W. B., Hensall, Ont.
Ferguson, P. H., Sedley, Sask.
Fairles, T. F., Bloomington, Ont.
Finn, R. A., Fletcher, Ont.
Fortier, T. H., Ottawa, Ont.
Francis, J. F., Burford, Ont.
Francis, T. E., Richmond, Va.
Frejd, D., Bruce Mines, Ont.
Garrett, F. A., Tweed, Ont.
Goodman, F. L., Port Dalhousie, Ont.
Gordon, E. G., Elora, Ont.
Gray, A. J., Cartagena, Spain.
Guild, A. W., Jordan Harbour, Ont.
Hall, E. R., St. Albert, Alta.
Hart, E. W., Burford, Ont.
Higinbotham, C. F., Queenston, Ont.
Higman, C. G., Ottawa, Ont.
Hinman, R. B., Wicklow, Ont.
Holmes, H. M., Raymond, Alta.
Horobin, H. P., Cornwall-on-Hudson, N.Y.
Jones, S. F., London, Ont.
Kirkley, F., Warkworth, Ont.
Laird, D. G., Howe Sound, B.C.
Lawrence, J. W., Mandaumin, Ont.
Lindsay, J. F., Cherry Grove, Ont.
Lindesay, H. H., Ottawa, Ont.
Martin, N. R., Springfield, Ont.
McDowell, C. E., Dawn Valley, Ont.
McElroy, H. M., Chesterville, Ont.
McQueen, M. J., Guelph, Ont.
Mucklow., G., Victoria, B.C.
Neilson, J. A., Port Dover, Ont.
Overholt, P., Vankleek Hill, Ont.
Peren, G. S., Kelowna, B.C.,
Powers, G. N., Orono, Ont.
Robertson, J. R., Toronto, Ont.
Rumsby, R. W., Wimbledon, London, England.
Sanderson, T., Byron, Ont.
Sands, D. R., Sykeston, Ont.
Smith, D. M., Toronto, Ont.
Smith, M. T., Guelph, Ont.
Smith, P. W., Beamsville, Ont.
Smylie, J. S., Westholme, B.C.,
Steckle, H. S., Strasburg, Ont.
Sutton, R. G., Norwich, Ont.
Tawse, W. J., Guelph, Ont.
Thompson, W., Westwood, Ont.
Townsley, W, A., North Vancouver, B.C.
Van der Byl, P. G., Pretoria, S.A.
Varey, J. M., Rocklyn, Ont.
White, W. R., Ashburn, Ont.
Williams, A. H., Toronto, Ont.

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First Class Men.

The work of the College is divided into Departments, and all candidates who obtain an aggregate of seventy-five per cent. of the marks allotted to the subjects in any Department are ranked as first-class men in that Department. The following list contains the names of those who gained a first-class rank in the different departments; (examinations held in April, 1913; arranged alphabetically.)

First Year.

Andrew, J. F., in two departments—English and Mathematics, and Chemistry and Physics.
Austin, W. J., in two departments—English and Mathematics, and Chemistry and Physics.
Bennett, W., in two departments—English and Mathematics, and Chemistry and Physics.
Brown, C. S., in three departments—English and Mathematics, Chemistry and Physics and Agriculture.
Carncross, E. E., in two departments—English and Mathematics, and Chemistry and Physics.
Clemens, L. P., in three departments—English and Mathematics, Chemistry and Physics, and Agriculture.
Cotsworth, F. B., in three departments—English and Mathematics, Chemistry and Physics, and Agriculture.
Culp, E., in two departments—English and Mathematics, and Chemistry and Physics.
Donaldson, J. R., in one department—English and Mathematics.
Elliott, G. A., in one department—English and Mathematics.
Ferguson, C. D., in two departments—English and Mathematics, and Chemistry and Physics.
Garlick, G., in three departments—English and Mathematics, Chemistry and Physics, and Biology.
Hastings, R. J., in three departments—English and Mathematics, Chemistry and Physics, and Biology.
Huckett, H. C., in two departments—English and Mathematics, Chemistry and Physics.
Hunter, R. C., in one department—English and Mathematics.
Jones, M., in two departments—English and Mathematics, Chemistry and Physics.
Knoop, M., in one department—English and Mathematics,
Lord, L., in two departments—English and Mathematics, Chemistry and Physics.
McDermott, A. M., in one department—English and Mathematics.
McLarty, J. E., in one department—Chemistry and Physics.
Small, E. L., in one department—English and Mathematics.
Stothers, S. B., in one department—English and Mathematics.
Waterman, S., in two departments—English and Mathematics, Chemistry and Physics.
Weston, E. W., in one department—Chemistry and Physics.
White, A. H., in two departments—English and Mathematics, Chemistry and Physics.
Yule, R. G., in one department—Biology.

Second Year.

Bell, W. J., in one department—English.
Connon, P. C., in one department—English.
Cory, A., in three departments—English, Chemistry and Physics, Biology.
Finn, R. A., in one department—English.
Frejd, D., in one department—Chemistry and Physics.
Guild, A. W., in one department—English.
Hinman, R. B., in one department—English.
Leigh, A., in one department—English.
Martin, N. R., in two departments—Chemistry and Physics, Agriculture.
McQueen, M. J., in three departments—English, Chemistry and Physics, Agriculture.
Smylie, J. S., in four departments—English, Chemistry and Physics, Biology, Agriculture.
Varey, J. M., in one department—Chemistry and Physics.

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Scholarships.

Scholarships of $20 in money were awarded for groups of subjects in First Year work as follows: Highest standing with a minimum of forty per cent. of the marks of each subject, and an aggregate of seventy-five per cent. of the total number of marks allotted to the subject in the group:

Agriculture—L. P. Clemens, Galt, Ont.
Biological Science—R. J. Hastings, Formosa, Japan.
English and Mathematics—C. S. Brown, Peterborough, Ont.
Physical Science—G. Garlick, Heathfield, Thakeham, Sussex, England.

Professional Dairy School Certificates Issued During 1913

Armstrong, Marshall, Carthage, Ont. ..... Cheesemaking
Arscott, W. J., Whitechurch, Ont. ..... Buttermaking
Calder, Martin, Gladstone, Ont. ..... Cheesemaking
Conway, J. H., Bright, Ont. ..... Cheesemaking
Goggin, C. F., Elgin, N.B. ..... Buttermaking
MacKenzie, J.D., Jarvis, Ont. ..... Butter and Cheesemaking
Smith, G. R., Kintore, Ont. ..... Cheesemaking

List of Graduates from Home Economics Courses in 1913.

Two-year Normal Course in Domestic Science:

1. Miss Helen G. Campbell, Campbell's Cross, Ont.
2. " Greta Crowe, Guelph, Ont.
3. " Louise Griffin, Galt, Ont.
4. " Mayme C. Kay, Eberts, Ont.
5. " Hazel Leonard, Napanee, Ont.
6. " Laura Lyon, Guelph, Ont.
7. " Edith MacGregor, St. Thomas, Ont.
8. " Carrie MacLaurin, Vankleek Hill, Ont.
9. " Frederica Oliver, Hammond, B.C.
10. Mrs. Mary Oliver, Niagara Falls, Ont.
11. Miss Robina Templeton, Belleville, Ont.

One-year Normal Course in Domestic Science:

1. Miss Florence M. Day, Marysville, N.B.
2. " Ethel O. Farrant, Mitchell, Ont.
3. " Marjorie Johnston, Cobourg, Ont.
4. " Lillian R. Lawrence, Ottawa, Ont.
5. " Beulah Miller, Smith's Falls, Ont.
6. " Elizabeth P. Porter, Stratford, Ont.
7. " Elfrida W. Ridgway, Laurentian View, Ont.
8. " Augusta E. Shorey, Lindsay, Ont.
9. " Lucy White, Cobourg, Ont.

Housekeeper Course:

1. Miss Lillie A. Beattie, Blair, Ont.
2. " Ada B. Currie, Ospringe, Ont.
3. " Nellie C. Goldie, Guelph, Ont.
4. " Ruth M. Goldie, Guelph, Ont.
5. " Harriet Johnson, Upper Stewiacke, N.S.
6. Mrs. MacPhadyen, Lindsay, Ont.
7. Miss Rebecca Nesbitt, Ottawa, Ont.
8. " Maud O'Droskie, Guelph, Ont.
9. " Edna Schwalm, Guelph, Ont.
10. " Louise C. Tilt, Blair, Ont.
11. " Mary H. Turpin, Hamilton, Ont.
12. " Elizabeth C. Wilson, Scotch Line, Ont.

C. Homemakers:

1. Miss Florence M. Ellis, Sarnia, Ont.
2. " Marianne E. Robinson, St. John, N.B.
3. " Mary C. Stevenson, Vancouver, B.C.

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A. Homemakers:

1. Miss Bertha Alexander, Toronto, Ont.
2. " Marjorie C. C. Armour, Allan's Mills, Ont.
3. " Mary M. M. Armour, Allan's Mills, Ont.
4. " Elma Bell, Toronto, Ont.
5. " Hope Eadie, Scotland, Ont.
6. " Jean Gosnell, Highgate, Ont.
7. " Ruth Hart, Brantford, Ont.
8. " Dorothy V. Hartman, Clarksburg, Ont.
9. " Irene Martin, Jordan Harbor, Ont.
10. " Ina Munroe, Winnipeg, Man.
11. " Helen Oldham, Brantford, Ont.
12. " Mabel Potter, Toronto, Ont.
13. " Hazel Pound, Ridgeway, Ont.
14. " Eva E. Powis, Hamilton, Ont.
15. " Jean Sinclair, Belleville, Ont.
16. " Iva Springer, Guelph, Ont.
17. " Violet Springer, Guelph, Ont.
18. " Dora Talbot, Lacombe, Alta.
19. " Alice F. Winslow, Chelsea Green, Ont.
20. " Winifred A. Woodworth, Niagara Falls, Ont.

B. Homemakers:

1. Miss Edna G. Aitken, Beeton, Ont.
2. " Anna Eckert, London, Ont.
3. " Hattie Huehn, Waterloo, Ont.
4. " Bessie M. E. Munn, Hensall, Ont.
5. " Norma Ross, Embro, Ont.

SUMMARY OF ATTENDANCE IN 1913.

A.—January to June, completing the College year of 1912-1913.

1. *Normal Domestic Science:*

(a) Juniors of Two-year course	14
(b) Seniors of Two-year course	11
(c) Seniors of One-year course	9

2. *Associate Course—Two-year course:*

(a) Juniors	8

3. *Housekeepers—Two-year course:*

(a) Juniors	6
(b) Seniors	12

4. *Homemakers—One-year course*	50
5 *Short Course in Domestic Science:*	
(a) Winter term students	26
(b) Spring term students	22
6. *Optional*	8
7. *Student-workers*	3
8. *Public School students*	65

B.—September to December, opening the College year of 1913-1914.

1. *Normal Domestic Science—Two-year course:*

(a) Juniors	13
(b) Seniors	12

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2. *Normal Household Science—One-year course* 10
3. *Associates.—Two-year course*:
   (*a*) Juniors 12
   (*b*) Seniors 8
4. *Housekeepers—Two-year course*:
   (*a*) Juniors 9
   (*b*) Seniors 4
5. *Homemakers—One-year course* 42
6. *Short Course in Domestic Science* 24
7. *Optional* 7
8. *Student-workers* 2
9. *Public School students* 49

C.—Students counted in both above lists:

1. *In long courses* 41
2. *In Public School classes* 4

D.—Total number of students in 1912 365
Total number of students in 1913 381

MEDALS, SCHOLARSHIPS AND PRIZES AWARDED APRIL, 1913.

The George Chapman Scholarship.

(A prize of $20 in books awarded on the work in English of the first two years.)

The three divisions of the work under the English Department are taken into consideration in awarding the prize, namely, English Literature, English Composition and Public Speaking. Winner in 1913: Andrew Cory, Prince Albert, Sask.

Prizes.

Three prizes of the value of $10 each in books were awarded as follows:

One to the second year student who composed and read before a committee the best essay on the subject assigned for the year, viz., "Potato-Growing,"—Andrew Cory, Prince Albert, Sask.

One to the student who stood first in General Proficiency on first and second year work—Theory and Practice—Andrew Cory, Prince Albert, Sask.

SPECIAL PRIZES.

Canada Industrial Scholarships.

First: G. J. Jenkins, Todmorden, Ont. Subject: "The City Milk Supply."

Second: C. S. Brown, Peterborough, Ont. Subject: "The Country Church and the Rural School in relation to the Country's Ideals and Development."

Third: R. H. Ferguson, New Zealand. Subject: "Fertilizers and Their Use."

Medals.

Governor-General's Silver Medal: First in General Proficiency, first and second year work, 1912-1913. Winner: Andrew Cory, Prince Albert, Sask.

All of which is respectfully submitted.

G. C. CREELMAN.

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FINANCIAL STATEMENT, 1913

COLLEGE DEPARTMENT.

EXPENDITURE.

Salaries and wages	$78,932 85
Servants' pay list	4,158 85
Meat, bread, groceries, laundry, engine room supplies and fuel	37,793 50
Advertising, printing, postage and stationery	3,988 23
Expenses, Short Courses	1,625 20
Temporary assistance	1,651 65
Student labor	3,712 22
Travelling expenses and extra lectures	1,949 66
Library	1,650 62
Scholarships	90 00
Telephone service, rents, etc.	528 30
Furnishings and repairs	4,657 54
Sewage	540 00
Contingencies	1,345 62
Maintenance, 5 laboratories and gymnasium	7,699 84
Total Expenditure	$150,324 08
Less Revenue	41,600 11
Net Expenditure	$108,723 97

REVENUE.

Board	$22,851 25
Tuition and laboratory fees	17,229 00
Chemical analyses	198 15
Rent of rooms	166 50
Rent of cottages	260 00
Rent of Post Office boxes	40 50
Supplemental examinations	262 00
Fines and breakages	532 20
Sale of old horse	50 00
Sundries	10 51
Total Revenue	$41,600 11

STUDENT LABOR, 1913.

(12 months.)

Total per Month.

October 14th to 31st	$368 11
November	796 72
December and January	761 70
February	330 62
March	313 51
April	142 60
May	104 79
June	96 97
July	4 81
August	99 48
September, and to October 11th.	692 91
Total	$3,712 22

To Different Departments.

College	$259 83
Chemical	26 48
Botanical	17 47
Bacteriological	18 31
Physical	53 23
Entomological	19 49
Gymnasium	24 74
Library	23 71
Nature Study	12 58
Farm Dept.	1,050 05
Experimental Dept.	613 30
Dairy	18 96
Poultry	332 53
Pomology	452 87
Landscape Gardening	316 35
Mechanical Dept.	276 70
Apiculture	195 62
Total	$3,712 22

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MACDONALD INSTITUTE AND HALL.

EXPENDITURE.

Salaries and wages	$19,890 00
Servants' pay list	2,149 48
Meat, bread, groceries, furnishings, repairs, engine room supplies, fuel and labor on grounds	15,581 14
Maintenance of laboratories in Institute	3,218 19
Library and stationery	707 80
Total Expenditure	$41,546 61
Less Revenue	22,865 07
Net Expenditure	$18,681 54

REVENUE.

Board	$14,840 97
Tuition and laboratory fees	7,926 50
Fines, breakages, etc.	86 20
Sundries	11 40
Total Revenue	$22,865 07

FARM DEPARTMENT.

EXPENDITURE.

Permanent improvements	$452 65
Wages of men, foreman and stenographer	8,746 44
Purchase and maintenance of stock	6,315 24
Farm maintenance, including repairs, blacksmithing, binder twine, seed, furnishings, fuel, light, advertising, printing, stationery, tools, implements, etc.	2,691 61
Contingencies	255 48
Total Expenditure	$18,461 42
Less Revenue	7,525 08
Net Expenditure	$10,936 34

REVENUE.

Sale of Cattle:—		
14 Calves at from $2.00 to $100.00	$479 00	
12 Cows at from $50.00 to $150.00	1,288 00	
1 Heifer	35 00	
3 Steers, 5,210 lbs. at from $10.00 to $12.00 cwt.	549 20	
2 Carcasses, 1,360 lbs. at $10.00 cwt.	136 00	
		$2,487 20
Sale of Pigs:—		
32 Hogs, 7,900 lbs. at from $8.25 to $10.00 cwt.	$657 00	
11 Sows at from $12.50 to $25.00	212 50	
8 Boars at from $10.00 to $12.50	82 50	
		952 00
Sale of Sheep:—		
17 Lambs, 1,915 lbs. at from $6.25 to $10.00 cwt.	$121 94	
15 Lambs at from $7.00 to $12.00	135 00	
1 Ram	8 00	
1 Ewe	5 00	
		269 94
Sale of Milk:—		
11,925 quarts at 4c.	477 00	
97,535 lbs. milk at $1.60 cwt.	1,560 56	
2,209.27 lbs. fat at from 27c. to 34c.	656 38	
		2,693 94

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Service of animals	138 00
Sale of 800 bushels potatoes at 60c.	480 00
Sale of 28 bushels barley at 75c.	21 00
Sale of 14 bags at from 25c. to 30c.	4 00
Sale of 49 loads old rails at $1.00	49 00
Sale of 1 team horses	430 00
Total Revenue	$7,525 08

EXPERIMENTAL DEPARTMENT.

EXPENDITURE.

Permanent improvements	$711 02
Assistant, specialist in plant breeding, stenographer, foreman, teamsters and laborers	12,868 95
Seeds, manure and special fertilizers	956 79
Furnishings, implements, repairs, blacksmithing, etc.	896 63
Printing, postage, stationery and contingencies	467 59
Feed of horses	200 00
Total Expenditure	$16,100 98

DAIRY DEPARTMENT.

EXPENDITURE.

Permanent improvements	$474 67
Wages, including foreman, cheesemaker, buttermaker, engineer, stenographer and bookkeeper, assistant and official tester of dairy cattle	2,977 62
Purchasing, hauling and manufacturing milk into butter and cheese	2,175 55
Furniture, furnishings, repairs, etc., laboratory expenses, gas, chemicals, etc., and contingencies	636 57
Fuel and light	299 93
Total Expenditure	$6,564 34
Less Revenue	3,269 86
Net Expenditure	$3,294 48

REVENUE.

Sale of cheese, 16,067 7-16 lbs. at from 10c. to 60c.	$2,357 29
Sale of butter, 161 lbs. at from 15c. to 26c.	32 91
Sale of cream, 1,394 quarts at 25c.	348 50
Sale of ice cream, 97½ gallons at from 75c. to $1.60	80 93
Sale of skimmed milk, 66,890 lbs. at 20c. cwt.	133 78
Sale of buttermilk, 13,400 lbs. at 20c. cwt.	26 80
Sundries	54 65
Rent	235 00
Total Revenue	$3,269 86

DAIRY SCHOOL.

EXPENDITURE.

Wages of instructors, engineer, janitor, stenographer and bookkeeper	$2,374 50
Cleaning, painting, repairs and contingencies	66 19
Dairy appliances, separators, vats, expenses cheese and butter judges, inspecting factories, etc.	498 71
Advertising, printing, stationery, postage, books, papers, etc.	87 21
Fuel and light	599 99
Purchase of milk for cheesemaking and cost of hauling milk and cream	1,955 84
Total Expenditure	$5,582 44
Less Revenue	801 97
Net Expenditure	$4,780 47

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REVENUE.

Sale of cheese, 2,132 1-16 lbs. at from 13c. to 60c.	$400 38
Sale of cream, 435 quarts at 25c.	108 75
Sale of ice cream, 93⅝ gallons at from 80c. to $1.60	80 15
Sale of skim milk, 57,220 lbs. at 20c. cwt.	114 44
Fees	93 00
Sundries	5 25
Total Revenue	$801 97

POULTRY DEPARTMENT.

EXPENDITURE.

Wages of assistant, stenographer and temporary assistance		$1,784 85
Furnishings and repairs		997 69
Permanent improvements		23 70
Purchase of stock		200 00
Fuel, light and contingencies		349 87
Experiments with incubator, fattening and feed		3,499 47
Feed of horse		50 00
Purchase of horse		230 00
Total Expenditure		$7,135 58
Less Revenue		5,170 23
Net Expenditure		$1,965 35
Sale of Live Poultry:—		
572 live birds for	$888 50	
230 chicks at from 5c. to 10c.	17 50	
		$906 00
Sale of Dressed Poultry:—		
8,995 11-16 lbs. at from 12c. to 50c.		1,709 59
Sale of Eggs for Hatching:—		
721½ settings for	828 50	
9,642 eggs at from 2c. to 10c.	611 55	
		1,440 05
Sale of Eggs for Domestic Use:—		
4,187 dozen at from 20c. to 60c.		1,114 59
Total Revenue		$5,170 23

POMOLOGY DEPARTMENT.

EXPENDITURE.

Permanent improvements	$296 69
Foreman, fireman, stenographer, teamsters and laborers	3,991 02
Manure, trees, plants, bulbs, implements, tools, furnishings, repairs and contingencies	1,649 69
Fuel and light	366 05
Feed of horses	200 00
Total Expenditure	$6,503 45
Less Revenue	1,058 96
Net Expenditure	$5,444 49

REVENUE.

Sale of fruit and vegetables as per statements rendered monthly	$1,058 96

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LANDSCAPE GARDENING DEPARTMENT.

EXPENDITURE.

Permanent improvements	$194 57
Foreman, assistant, fireman, teamsters, stenographer and laborers	3,722 90
Manure, trees, plants, bulbs, seeds, tools, furnishings, repairs and contingencies	945 62
Fuel and light	386 97
Feed of horses	100 00
Total Expenditure	$5,350 06

MECHANICAL DEPARTMENT.

EXPENDITURE.

Salary of foreman	900 00
Tools, furnishings and repairs	240 34
Total Expenditure	$1,140 34

APICULTURE DEPARTMENT.

EXPENDITURE.

Equipment, maintenance and wages	$1,749 48
Less Revenue	309 46
Net Expenditure	$1,440 02

REVENUE.

Sale of Honey:—	
1,292 lbs. at from 8c. to 11½c.	$121 96
Sale of Bees:—	
15 Hives at $12.50	187 50
Total Revenue	$309 46

SOIL PHYSICS DEPARTMENT.

EXPENDITURE.

Services and expenses of temporary assistants in connection with Farm Drainage Demonstrations	$3,999 72

FORESTRY DEPARTMENT.

EXPENDITURE.

Contingencies	$1,292 82

SUMMARY.

	Expenditure.	Revenue.	Net Expenditure.
College	$150,324 08	$41,600 11	$108,723 97
Macdonald Institute and Hall	41,546 61	22,865 07	18,681 54
Farm	18,461 42	7,525 08	10,936 34
Experimental	16,100 98	.....	16,100 98
Dairy	6,564 34	3,269 86	3,294 48
Dairy School	5,582 44	801 97	4,780 47
Poultry	7,135 58	5,170 23	1,965 35
Pomology	6,503 45	1,058 96	5,444 49
Landscape Gardening	5,350 06	.....	5,350 06
Mechanical	1,140 34	.....	1,140 34
Apiculture	1,749 48	309 46	1,440 02
Soil Physics	3,999 72	.....	3,999 72
Forestry	1,292 82	.....	1,292 82
	$265,751 32	$82,600 74	$183,150 58

S. SPRINGER,
Bursar and Superintendent.

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PART II.

THE PROFESSOR OF ENGLISH.

To the President of the Ontario Agricultural College:

SIR,—I have the honor to present herewith my nineteenth annual report of the Department of English.

The large increase in the number of students has thrust a perplexing problem upon this department. Every class-room available for our work is overcrowded. The room in Macdonald Institute, which we have used for some years—and which, by the way, is at best only a temporary shift—is furnished with eighty-four permanent seats. There are over one hundred and ten students in each division of the first year. There are one hundred and eight in the second year. The class-room in Massey Hall that has been used for third and fourth year lectures has fifty-eight seats. There are sixty-nine students in the present third year. The only other room we can use is Massey Hall, which is an auditorium, not a class-room. The crowding makes good discipline and good attention impossible. The over-large classes, even if we had rooms big enough to seat every student of a class, make teaching impossible, and compel us to resort entirely to the lecture method.

In April of this year, Mr. G. H. Unwin, B.S.A., for two years lecturer in English, resigned his position to take up farming in Western Canada. Mr. Unwin, by his geniality, made himself very acceptable both to the students and to his colleagues, and his tact and scholarship made him a successful teacher. His going was a distinct loss to the department. We were very fortunate, however, in securing Mr. J. W. Charlesworth, B.A., who for many years had been on the staff of the Guelph Collegiate Institute. Mr. Charlesworth is a skilful and experienced teacher. We may judge of his value by the reluctance of the Guelph Board of Education in parting with him, and the honorarium which they have voted him as a farewell gift. Mr. Curtis, the new Dean of Residence, is giving efficient service as instructor in composition. Mr. LeDrew's work in teaching composition and in directing the public speaking classes continues to be, what it always has been, excellent.

Respectfully submitted,

J. B. REYNOLDS.

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PART III.

THE PROFESSOR OF CHEMISTRY.

To the President of the Ontario Agricultural College:

SIR,—I have the honor to present herewith the following report of the Department of Chemistry.

The course of instruction outlined in the College Calendar has been faithfully carried out, with, however, such improvements as experience has suggested. The method inaugurated two years ago of systematically examining and correcting the students' records of each week's work has been very helpful. It makes it possible for us to keep in close touch with the progress of each individual. It also trains the student to make exact records of the work performed, and affords us an opportunity to correct any mistakes at once. This part of the work consumes a great deal of time and has been well and faithfully carried out by Messrs. Fulmer, Galbraith, and Gibson.

Some years ago the instruction in Geology was assigned to the Department of Chemistry, and our endeavor has been to make the subject as practical as possible from the standpoint of the student of agriculture. Particular stress has been laid upon the geology of soil formation, the general topography of the country, and the various influences that have operated to bring this about. Whenever possible, excursions over fields and nearby points of interest are made to enable the students to more fully understand the meaning of the matters discussed in the class-room. Emphasis is also laid on the economic products of the country, not only with reference to our deposits of precious metals, but also touching on the deposits of materials used in the manufacture of fertilizers, cements, brick, tile, lime, etc. In connection with this study I want to place on record my appreciation of the good work done by Mr. A. J. Galbraith of this department.

In addition to the regular courses, we have given the usual lectures and practical work to the students of the various short courses. This summer, for the first time, lectures and practical work were given to the High School Science teachers. The work was apparently much appreciated, but the time devoted to this course, together with that taken by the Nature Study and Elementary Agriculture courses, consumes a large portion of our time that was formerly devoted to research work.

Outside the laboratory, the usual amount of instruction has been given by way of correspondence. The particular feature of this work during the past year has been the very large number of letters received regarding soils and fertilizers. In many cases the letters were accompanied by samples, which had to be examined chemically before replying. We have also been privileged to aid in the spreading of agricultural information by way of articles to agricultural and technical papers and by addressing meetings of various kinds.

EXAMINATION OF MISCELLANEOUS SAMPLES.

We receive every year a large number of samples for analysis. Some of the analytical work asked for was of a purely commercial nature and clearly work we should not undertake. All such correspondents were referred to commercial

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chemists in Toronto, Hamilton, and Montreal. There were, however, over 200 samples of materials either fully or partly analyzed and reports made thereon. These samples may be classified as follows:—

Soils	89	samples
Fertilizing materials	37	"
Cattle feeds	30	"
Human foods	10	"
Water	19	"
Insecticides and fungicides	11	"
Dairy products	20	"
Miscellaneous	24	"
Total	240	"

INVESTIGATIONS.

Wheat and Flour.

During the year we tested 163 samples of flour and 50 samples of wheat for millers and bakers. We also milled and baked over 80 samples of wheat of the crop of 1912 for the Department of Field Husbandry, and about ninety samples of the crop of 1913 are now milled ready to bake.

As in former years, we have secured the standard grades of wheat grown in the Western Provinces and tested these to see how they compare with the previous years. The wheat of this year's crop is a fine sample and has graded high. It is a plumper berry, but does not contain so much gluten as the wheat of the 1912 crop. What there is, however, is of good quality and the flour makes a loaf of good color and texture, although there are some indications that the flour will not stand as much fermentation as that made from last year's wheat. The following are the results obtained from testing composite samples of the grades received from the office of the Chief Grain Inspector, Winnipeg:—

	Per cent of wet Gluten.	Per cent. of water absorbed.	Weight of loaf grams.	Volume of loaf cc.	Quality of Loaf.		
					Color.	Texture.	Appearance.
No. 1 Hard.....	36.20	70.0	517	2670	100.0	100.0	100.0
" 1 Northern ..	38.30	69.4	522	2620	99.5	90.0	100.0
" 2 " ..	36.45	69.4	523	2620	99.0	98.0	98.0
" 3 " ..	36.70	73.2	525	2580	99.0	97.0	97.0
" 4 " ..	37.30	72.3	528	2520	98.0	95.0	96.0

Experiments show that the flour from Ontario grown winter wheat is very much superior to that of last year. The comparison given below of two straight grades milled in our own laboratory will bear out this statement:

	Per cent. of wet Glu'en.	Per cent. of water absorbed	Weight of loaf grams.	Volume of loaf cc.	Quality of Loaf.		
					Color.	Texture.	Appearance.
Straight Grade 1912 crop	23.25	48.8	477	1840	100.0	100.0	100.0
Straight Grade 1913 crop	25.35	46.0	467	1900	98.0	104.0	102.0

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Naturally, the bread from the new wheat is not as good in color; but even the fresh milled flour of this year's crop gave a loaf of greater volume and better texture.

In the summer several weeks were spent in studying the effect of the amount of water and time of exposure on wheat that was to be milled. We used 3, 5, 7, and 9 per cent. of water in this "conditioning" process and varied the time from 30 minutes to 48 hours. The best results on the wheat we had to deal with were obtained when 5 per cent. of water was added and allowed to stand for six hours before milling.

We also studied the influence of various kinds of fats used in the baking process on the quality of bread. This work was done in co-operation with Dr. C. Saunders, Cerealist, Dominion Experimental Farm, of Ottawa.

The experimental work on the effect of germination of wheat on the quality of the flour produced was continued, as was also the influence of different kinds of malt in the quantity and quality of bread.

Soils.

We have had a very large number of samples of soil submitted for examination. Of these, 89 were more or less fully analyzed. Many of our correspondents apparently think that laboratory tests will tell the whole story regarding the ailments of the soil. Unfortunately, this cannot be done, for there are a number of problems besides the mere question of composition that must be considered and many of these cannot be studied without seeing the soil in its natural position.

During the last few years there has been a widespread interest in swampy or peaty soils. These are naturally rich soils and are especially adapted to truck farming. In some instances it requires the expenditure of large sums of money to properly drain these swamps, and, for this reason, syndicates representing large amounts of money have, in some instances, bought up these areas and are draining them and then reselling in small acreages. As a result, we have been constantly consulted regarding the productive capacity of various swamp lands. It, therefore, seemed advisable for us to investigate the extent and nature of these areas. This study has been made possible by the money received from the Federal Grant for soils. This season we have examined nearly all the main swamps in the Province. Particular attention has been given to swamps that were drained enough to bring part of them under cultivation. We have made records of the depth and nature of the muck and the nature of the underlying soil. Samples for analysis were also taken from each of the swamps visited. These are now being analyzed with the object of ascertaining their content of mineral plant food, in which they are frequently deficient. In many instances the cultivation of these soils has not been remunerative, and we hope by means of trial plots to demonstrate that they can be made very productive.

We have also carefully sampled the whole of the College farm, boring in every case deep enough to ascertain the nature of the underlying soil. These samples we hope to analyze with a view to pointing out the natural deficiencies of the soil.

Cattle Feeds.

There is evidence that the farmers are becoming more familiar with the Commercial Feeding Stuffs' Act, for we are frequently asked to analyze feeds to see if they are up to the guarantee. This work, however, more properly belongs

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to the Inland Revenue Department, Ottawa, the department under which the Act is operated. They offer to make analyses for purchasers of feeds when samples have been taken according to their directions, for one dollar per sample, which is only a nominal charge for the work. We have had frequent requests from the manufacturers of commercial feeds to analyze their products, as they claim it is sometimes impossible to get chemists to do the work for them. As they are required to furnish the percentage composition on which they base their guarantee when submitting the sample for registration, their difficulty is apparent, but we have been able in most cases to direct them to where they could get the work done. Nearly all of the samples of feeds we analyzed have been at the request of our Farm department or some new material that has been placed on the market.

Water Analysis.

We have again been called upon to analyze a number of samples of water from farm wells and from rural schools, and again we have to report that a very large percentage of these were unfit for domestic use.

In conclusion, I wish to draw your attention to the need of altering and enlarging the Chemical building to meet the growing requirements of the larger number of students that are coming to us.

Respectfully submitted,

R. HARCOURT.

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PART IV.

THE PROFESSOR OF ENTOMOLOGY AND ZOOLOGY.

To the President of the Ontario Agricultural College:

SIR,—I have the honor to present my eighth annual report on the work of the Department of Entomology and Zoology.

INSTRUCTION.

The course of instruction during the year now drawing to a close has been carried out in accordance with the regulations prescribed in the College Calendar. There have been no changes worthy of mention, except in a few details, from the order of the preceding year. The difficulty in arranging the classes satisfactorily, which has been a subject of complaint for the last few years, has become greater than ever during this term owing to the large increase in the number of students. The lecture-room and laboratories are uncomfortably crowded, classes have to be subdivided, lectures duplicated and work and time absorbed, which would not be necessary if better accommodation could be provided.

After the close of the regular College course in April, we had the usual class of Normal School students who had completed their training and were about to enter upon their work as teachers. The class was much smaller than usual, rendering the task of instruction in the class-room and out-of-doors much simpler than in former years. They remained with us till the end of June and were immediately succeeded by a large Summer School of Ontario teachers, including for the first time a number of High School and Collegiate Institute Science teachers. This involved three courses of lectures, as there were two grades of Public School teachers, some of them having come to us for the second time. The new class was taken by Mr. A. W. Baker, who gave them an excellent series of instructions of an advanced character. This work covered the month of July, and during the first week in August the attendance was largely increased by the visit of a number of School Inspectors.

All but a few weeks of the year being thus taken up with teaching of various kinds, it was not possible to make much progress or do much systematic work in the way of investigation and research. Mr. L. Caesar, in his position as Provincial Entomologist for Ontario, is able to devote his whole time from April to September to economic work and the results of some of his investigations are given in this report. Owing to impaired eyesight I was unable myself to do any work requiring close observation, though I took the courses of lectures with the Normal Students and the Summer School, and also the entomological part of those given to the first year during the winter term. In September, I had a successful operation for the restoration of my eyesight, and the disability under which I had labored for some time has now happily been removed.

Associate Professor Jarvis obtained leave of absence in order to take a course of lectures at the University of Oxford, and was away from the College during the fall and winter terms. His place was taken by Mr. G. J. Spencer who performed the duties in the class-room and laboratory in an efficient and most satisfactory manner. Mr. Jarvis gives the following account of his work during the year:

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Report of Associate Professor Jarvis.

Before giving any details of my report I wish to express my very great appreciation of the kind consent of those in authority to my having leave of absence to pursue post-graduate work at Oxford last year.

With the advice of Dr. Pope, the censor of the non-collegiate body at Oxford, who was exceedingly kind during my visit to the University, I arranged a course of study which I considered would be most valuable to me in my work on my return to this College. As the greater part of my time is devoted to the zoological branch of our department, I decided that greater benefit to my work, and consequently to the College, would be derived from a course of study consisting largely of zoological subjects. Most of my work was done under the supervision of Prof. Gotch, of Magdalen College. For two terms I attended four lectures a week on animal physiology, two on vertebrate histology and two on general zoology. Two afternoons a week I spent in the laboratory doing research work in physiological chemistry and on muscle and nerve. One afternoon a week I attended Dr. Osler's lectures and devoted another to the examination of insect collections.

Since my return I have continued my investigations on Canadian parasites of man and domestic animals, and have prepared a host index of the parasites of horses, cattle, sheep, swine, goats, poultry, rabbits, dogs and cats. I have experimented with a number of remedies for animals suffering from these parasites and have had successful results. We find that inquiries for such remedies are constantly coming to the department.

During the past summer I have augmented my list of acarids or mites by a number of species. In the reports of the Entomological Society of Ontario I had already listed about sixty species, some of which were new. The economic importance of mites has been entirely neglected until very recently. Although possessing habits similar to those of insects, they are more nearly allied to the spider family and, as such, are outside the field of the entomologist. However, their wide distribution and consequent great possibilities for destruction make them of great economic importance to the zoologist. Some species, such as the Red-spider mite and Pear-leaf-blister mite destroy foliage, while another species of Red-spider mite is the worst enemy of poultry. The cheese mite is a common pest in dairies. The ticks and sheep scab mites attack domestic animals, and other species become a great nuisance in damp, poorly-lighted houses.

Millipedes and sow bugs, two groups also closely related to insects, have given considerable annoyance this season, and many inquiries for means of extermination have been received by the department.

I have continued my work on scale and gall insects, and have been successful in finding many species new to Ontario.

In systematic entomology I have confined my time this summer to two orders of insects, preparing lists for the catalogue of Canadian insects. In the Hemiptera I have listed about six hundred and fifty species, practically all of those known in Canada at the present time.

Report by Mr. Lawson Caesar.

In November, 1912, I had the honour of being appointed Provincial Entomologist, with general charge also of plant diseases, but owing to the pressure of College work was unable to take over the full duties of the office until the spring of 1913. These new duties fit in very naturally with my regular work as

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lecturer on insect pests and plant diseases; in fact, they merely extend that work and increase the responsibility. The most onerous part of the new task is the supervision of all the inspection work carried out in the Province under the terms of the Fruit Pests Act. Fortunately in this I have the very valuable assistance of Mr. Walter E. Biggar, the Provincial Inspector. Were it not for his efficient help I should have had very little opportunity to conduct any of the following lines of investigation.

INVESTIGATION WORK.—(1) *San José Scale*: During the past season with the aid of Messrs. G. J. Spencer and Jas. Neilson, the life history, present distribution in the Province, host plants and methods of controlling this pest have been investigated. The results of this work and of my own observations in the past, together with the experience of the fruit growers themselves in controlling the insect have been put into the form of a bulletin and been sent to press. This bulletin is entitled "The San José and Oyster-shell Scales." The latter scale was included because of its general prevalence in the Province and the amount of injury it had done. It is hoped that the bulletin will be available for growers early in 1914.

(2) *Cherry Fruit Flies*: During my summer's work in the Niagara district in 1912, I saw that two little known pests, because hitherto not studied in this Province, were causing a great deal of injury to the fruit of all kinds of cultivated cherries, except the very early varieties, and that it would be very helpful if a study of their life history could be carried out and an effective remedy discovered. Accordingly with the aid of Mr. G. J. Spencer I have worked out almost all the details of the life history of both species and have tested a means of control that promises to be very cheap, easy to apply and efficient. It seems advisable, however, to duplicate some of the work next year. As soon as this is done the results will be published in bulletin form so that they may reach everyone interested. Nearly two months were devoted by Mr. Spencer and myself to this work.

(3) *Apple Maggot or Railroad Worm*: In the report for 1912, it was stated that we hoped to complete the study of this insect this year. This would have been done had it not been for the unexpected diminution in its numbers, a diminution so great that really satisfactory orchards for testing the value of certain spray mixtures could not be found; hence this part of the work will require to be duplicated next season. It should not, however, require much time. When these tests have been made I hope to incorporate an account of this insect in the same bulletin with that of the Cherry Fruit Flies, which are closely allied in appearance, life history and general habits except that they attack cherries instead of apples. Mr. Ross for the Dominion Department of Entomology co-operated again this year with my assistant Mr. Chas. Good in the study of this insect.

(4) *Pear Blight, Fire Blight or Twig Blight*: This disease of apples and pears has now become so widespread through the Province and, in seasons favorable for its development, has done so much damage especially to pears and young apple orchards that it must be considered the most serious trouble that pear growers have to combat. Unfortunately there has never been in Ontario a thorough field test of control methods for it carried out. Seeing that, if sound, practicable instructions for combating it were to be given to the growers, it was absolutely necessary first to put them to a test ourselves, I brought the matter before Mr. Hodgetts, the Director of the Fruit Branch, and requested permission to assign a man to this work. The Director readily approved of the proposal and accordingly Mr. J. F. Anderson, a fourth year college student, was appointed. Four

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medium sized pear orchards were chosen for the purpose. Two of these were near Grimsby Beach, one near Winona and the fourth near Fruitland, all for convenience and demonstration purposes being situated alongside the H. G. & B. Electric Railway.

Mr. Anderson's duties were primarily to endeavor to keep the Blight entirely under control in these orchards. In doing this he was to carry out what seemed to be the best methods advocated in other parts of North America. He was also to observe what special precautions would be necessary in control work to prevent failure, and was to make as careful a field study of the disease itself and the various means of its distribution as time permitted. As often as I could I visited him, gave him any assistance in my power, and at the same time familiarized myself with the progress being made.

No difficulty was experienced this year in keeping all the orchards free, though one of them at the beginning of the season had been so badly affected that if it had not been for my request to leave it the owner would have cut it down as beyond hope of saving. Mr. Anderson did careful work and discovered several peculiarities of the disease that will be of special importance later in outlining a practical scheme of control.

As this season was not favorable for the rapid development and spread of Blight in the Niagara district it will be necessary to continue this work until such a season has been found so that we may be able to determine just what is possible in the way of control under those conditions.

(5) *Little Peach and Yellows*: Some further work has been done on the study of these diseases, especially along the line of testing the percentage of pits from diseased trees that will germinate if properly looked after. We have now proved by two years' work that if the pits are taken from trees not showing disease until late in the season as high as 7 or even 8 per cent. may under favorable conditions germinate. There is no proof, however, up to the present time that the seedlings from these pits will develop the disease, but we are keeping them to see if such will ultimately be the result. In the report of the Fruitgrowers' Association for 1912, will be found an account of the various experiments already performed on these diseases. Before further duplicating this work I think it wise to wait at least another year to see the results of these experiments.

In the control work on these diseases it is very encouraging to know that by carefully inspecting, marking and destroying diseased trees we are quickly bringing the Yellows and Little Peach under control. In 1911, we marked and destroyed between 50,000 and 60,000 trees, in 1912, this dropped to about 25,000, and this year, 1913, to 6,000. We hope to reduce the number still lower until the annual loss will be very inconsiderable.

A short report on the present conditions of these diseases will be found in the report for 1913 of the Fruitgrowers' Association.

(6) *Apple Scab*: In the south-western part of Ontario, especially in the counties of Brant, Oxford, Middlesex, Norfolk and Lambton, the fungus disease known as Apple Scab has been more destructive this year than I have ever known it to be in these counties before. Very few even of the good growers succeeded in controlling it by spraying. In most other parts of the Province thorough spraying readily controlled the disease. As a result of the general desire in the above counties to know why the scab had been so severe and the spray mixtures ineffective. I devoted some time to an investigation of the subject, and by a personal inspection and study of a number of orchards in several of these counties and a careful

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examination of their weather records and of two or three private diaries kindly loaned me for the purpose, I think I succeeded fairly well in solving the difficulty.

An account of this work and the practical conclusions to be drawn from it for the better control of the disease under similar conditions in the future was given in an address before the Fruit Growers' Association in Toronto, in November. This address under the heading "Apple Scab" will be found in the 1913 report of that Association.

WINTER INJURY.—During the last two years many trees in various parts of the Province have been killed by winter injury. Taking advantage of this fact I have devoted what time I could spare to studying the various forms of such injury and the special reasons for each. The subject, however, is a very difficult one and requires many years of observation and study. It deserves all the attention that can be given to it. A good knowledge of the effect of severe winters, especially in such a varied climate as our Province has, should enable a person to give hints to fruit growers or intending fruit growers that would save them many disappointments and no inconsiderable financial loss.

INSPECTION WORK.—The regular inspection of orchards for San José Scale, Black Knot, Peach Yellows and Little Peach has been carried out this year, and has, we believe, been more thorough than usual. There is still room, however, for improvement and we hope next year to make considerable further advance along this line.

All saleable nursery stock and some younger stock has been carefully inspected for San José Scale during the season. In any district where the scale was known or suspected to be present every tree was examined, but in districts far away from any scale the examination, though careful, was much more rapidly done, not every tree in such circumstances being examined. In all more than 4,000,000 trees were inspected. Any of these on which scale, whether dead or alive, was found were broken down and the nurseryman required to remove and burn them the same day. Wherever the condition of the nursery justified it, certificates of inspection and of apparent freedom from scale were given to the owner.

In addition to the inspection of the stock, close attention has been paid to seeing that all fumigation houses were put into proper condition, that all chemicals used were of proper strength and that no stock escaped fumigation. To do this work properly required a considerable increase in the number of inspectors.

In order moreover that nurserymen might have a fair chance to produce good clean stock, special attention has been given to the inspection of all neighboring orchards and of neglected trees in lawns, along roadsides or in fence corners. This inspection along with the consequent oversight of the destruction or thorough spraying of infested trees in such places was the inspector's earliest task before beginning the examination of the nursery stock itself. We have had on the whole good co-operation from the nurserymen in our efforts to secure clean stock, and are convinced that they will soon be very enthusiastic when they see how decidedly it is in their own interests as well as those of their customers and of the country generally.

INSTITUTES, SHORT COURSES AND PUBLICATIONS.—The pressure of college and other work prevented my attending so many short courses in horticulture and institute meetings as in previous years. However, I gave two addresses at the Fruit Growers' Association in Toronto, entitled respectively, "Apple Scab" and "Peach Insects and the Present Condition of Yellows and Little Peach." I also attended two orchard demonstration meetings in Durham County in September and delivered addresses at three fruit meetings during the winter.

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Several short articles on insects and diseases have been contributed to agricultural magazines. At the regular annual meeting of the Entomological Society of Ontario, I gave three papers: (1) "Insects of the Season in Ontario," (2) Some New or Unrecorded Ontario Insect Pests," and (3) "Arsenate of Zinc as a Substitute for Arsenate of Lead." As mentioned above, a bulletin on the San José and Oyster Shell Scales has been prepared and sent to press.

Jubilee of the Entomological Society.

A somewhat notable event in the history of Entomology in Canada was the Jubilee celebration of the Entomological Society of Ontario, which took place at the College during the last week in August. There were delegates present from a number of Universities and Scientific Societies in Great Britain and the United States as well as in Canada, and congratulatory letters and messages were received from Germany, Russia, and a large number of institutions and friends throughout North America. College graduates holding positions under Dr. C. Gordon Hewitt, Dominion Entomologist, were present from Nova Scotia, New Brunswick, Quebec, Ontario and British Columbia. Through the efforts of Dr. William Saunders, Ex-Director of the Experimental Farms of the Dominion, and myself the Society was organized fifty years ago, and has continued during half a century to grow and prosper and do much valuable work for the country and for science. I had the honour of being President for the Jubilee year. Our visitors were hospitably entertained in the college buildings, and through the kind attentions of President and Mrs. Creelman were made to thoroughly enjoy their visit. Among those who took part in the proceedings were several former Presidents of the Society and a number of members from different parts of Canada. A full account of the papers and addresses will be given in the forthcoming Annual Report of the Society in addition to the briefer abstract that appeared in the November issue of the *Canadian Entomologist*.

This Department of the College was represented at the annual meeting of the American Association for the Advancement of Science at Cleveland, Ohio, by Mr. Caesar and Mr. Baker. During the week they also attended the meetings of the Entomological Society of America and the American Association of Economic Entomologists. The writer had the honor of being elected President for the current year of the former of these two international societies.

Correspondence.

The correspondence of this department continues to increase from year to year, and enables us to give much assistance to farmers, fruit growers and gardeners, mill-owners and others who apply for information regarding insects that trouble them. The letters and specimens sent to us also help us to keep informed respecting any special outbreaks that occur during the season and of the localities where certain species are proving particularly destructive. The Bureau of Information on the College grounds during the June excursions, and our exhibit under Mr. Baker's supervision, at the Toronto National Exposition, with the distribution of bulletins, leaflets and spraying calendars, help very much to make known far and wide throughout the Province useful methods for controlling insect pests of all kinds.

Respectfully submitted,

CHARLES J. S. BETHUNE.

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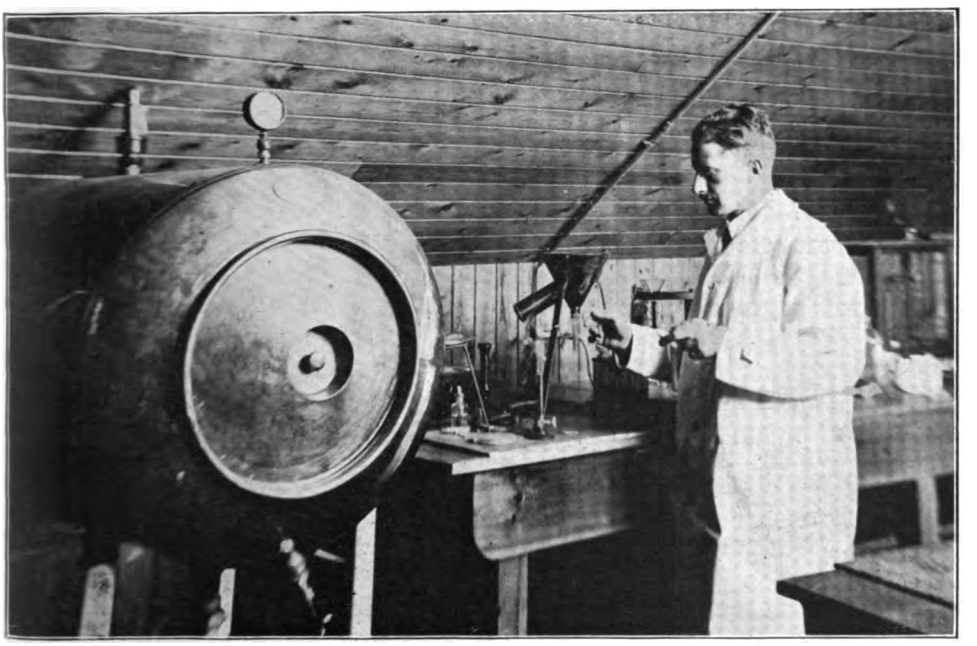
PART V.

THE PROFESSOR OF BOTANY.

To the President of the Ontario Agricultural College:

SIR,—I have the honor to submit my third annual report of the Department of Botany.

The courses of instruction outlined in the College calendar have been faithfully carried out. Lectures and laboratory work in botany have been given to the students of all years in the regular courses. In addition lectures and demonstrations have been given to the Short Course students in Stock and Grain Judging, Fruit-growing and Apiculture. During the spring and summer months special courses in field botany have been conducted for the students in Nature Study, Elementary Agriculture and High School Science. The academic work of the department now extends through eleven months of the year, leaving little time for investigation and research work.



A corner in the new Pathological Laboratory.

No radical changes have been made in any of the regular courses in Botany. The very large increase in the numbers of the students of all years has taxed the laboratory and lecture-room accommodation of the department to the utmost, making it exceedingly difficult to carry out the courses to best advantage. It is sincerely hoped that some means may be found to supply the ever-increasing demand for class-rooms and laboratories, so that the academic work of the department may not be hampered by over-crowding.

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New Equipment.

During the year our new pathological laboratory has been equipped with a Bramhill Dean autoclave and all the necessary apparatus to carry on research work in plant pathology. A travelling microscope for field work and a binocular microscope for fine dissecting have also been purchased. The very large increase in the number of students in the two senior years will necessitate the purchase of a number of new microscopes this year in order to maintain the efficiency of the laboratory work in botany.

Correspondence.

The correspondence of the department continues to increase. During the past twelve months an unusually large number of letters were received inquiring about weeds, weed seeds, wild plants, fungus diseases, and edible mushrooms. The increase in correspondence is in part due to the interest which teachers and pupils in rural schools are taking in nature study and school gardening. Numerous weeds and wild plants were received from them for identification.

Weeds.

Analysis of the correspondence carried on during the last twelve months indicates that the following weeds have attracted most attention: Field Bindweed (*Convolvulus arvensis*), Twitch Grass (*Agropuron repens*), Wild Mustard (*Brassica arvensis*), Bladder Campion (*Silene latifolia*), Perennial Sow Thistle (*Sonchus arvensis*), Crab or Finger Grass (*Digitaria sanguinalis*), Cypress Spurge (*Euphorbia cyparissias*), Chess (*Bromus secalinus*), Toadflax (*Linaria vulgaris*), Clot or Cockle Bur (*Xanthium canadense*), Salad Rocket (*Eruca sativa*)—in alfalfa, Skunk-tail Grass or Wild Barley (*Hordeum jubatum*)—this grass appears to be becoming common as a weed in Ontario. Smaller Catsfoot (*Antennaria neodiocia*)—in dry pastures; Thorn Apple or Jamestown Weed (*Datura stramonium*)—gardens and waste places; Orange Hawkweed or Paint Brush (*Hieracium aurantiacum*); Goat's Beard (*Tragopogum pratensis*)—on roadsides and in waste places; Sun Spurge (*Euphorbia helioscopia*)—in gardens; Russian Thistle (*Salsola kali*, var. *tenuifolia*)—in alfalfa fields.

The following are some of the plants sent in for identification which are comparatively rare as weeds in Ontario: Poke Weed (*Phytolacca decandra*)—from Waterford, Ont. Moneywort (*Lysimachia nummularia*)—reported as a weed in lawns and gardens in Cayuga, Ont. Sneeze Weed (*Helenium autumnale*)—Oil Springs, Ont. Golden Corydalis (*Corydalis aurea*)—cultivated fields, Matheson, Ont. European Gout Weed (*Agepodium podograria*, var. *variegatum*)—escaped from cultivation and growing as a weed near Simcoe, Ont. Poisoned Hemlock (*Conium maculatum*)—a poisonous weed found in an alfalfa field near Walkerton. Ont.

Purity Tests of Clover and Timothy Seeds.

Sixty samples of clover and timothy seed sent in by farmers and seedsmen during the year were examined and reported upon as to purity. They were graded according to the purity standard of the Seed Control Act. Out of twenty samples of red clover seed, three graded No. 1, six No. 2, three No. 3, and eight were disqualified. Out of sixteen samples of alsike seed, four graded No. 1, four No. 2,

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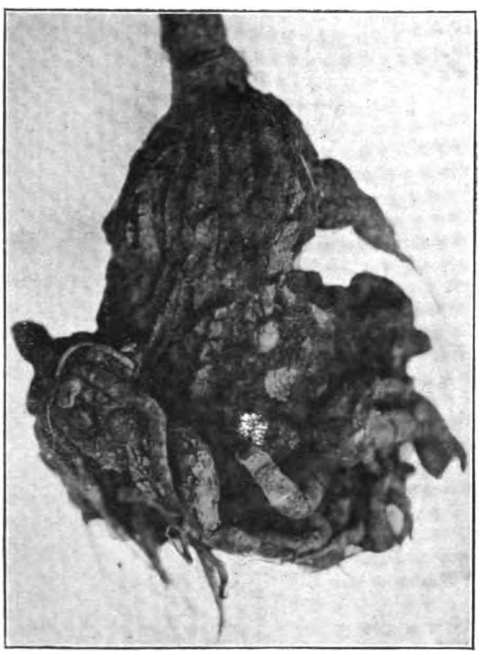
three No. 3, and five were disqualified. Only five samples of alfalfa seed were tested as to purity, and they all graded No. 1. Of the sixteen samples of timothy seed examined for purity, ten graded No. 1, three No. 2, and three No. 3.

Fungi and Plant Pathology.

The past season was not remarkable for outbreaks of fungus diseases. The usual number of inquiries were received, however, concerning the more common fungus diseases which are prevalent every year, to a greater or less extent. Numerous pathological specimens were also sent in for identification. Among these were some that are comparatively new in Ontario. These are dealt with more fully further on in the report. A considerable number of questions were also received concerning the nature of edible and poisonous mushrooms. These are discussed in



Club Root of Cabbage.

a short article prepared by Dr. Stone and inserted in this report. The following are amongst the diseases which, judging by the correspondence received, attracted most attention during the past season: Potato Scab (*Oospora scabies*), Black Knot (*Plowrightia morbosa*), Orange Rust of Blackberries (*Gymnoconia peckiana*), Hollyhock Rust (*Puccinia malvacearum*), Loose Smut of Oats (*Ustilago avenae*), Dry Rot of Potatoes (*Fusarium oxysporium*), Club Root of Turnips and Cabbage (*Plasmodiophora brassicae*), Fusarium Blight of Asters, Plum Pockets (*Exoascus pruni*), Leaf Spot or Shot Hole disease (*Cylindrosporium padi*), Fruit Rot of Tomatoes (*Macrosporium solani*), Blossom End Rot or Point Rot of Tomatoes.

Most of the more important of these are dealt with in various college bulletins and it is not necessary to discuss them here.

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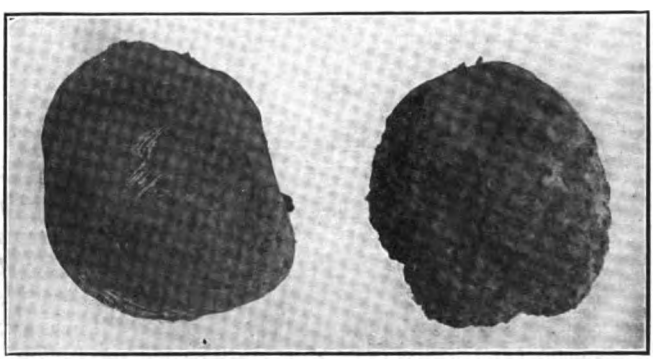
Plant Diseases Comparatively New in Ontario.

Club Root of Cruciferus Plants (*Plasmodiophora brassicae*).—Several times during the last two or three years reports have been received of the occurrence of this disease in Ontario. It was never possible, however, to confirm these reports and it was not until this summer that plants attacked by Club Root were sent into this department. Mr. S. C. Johnson, Vegetable Specialist for the Ontario Department of Agriculture, reports finding Club Root in the following counties: York, Peel, Lambton, and Wentworth. It would seem, therefore, that the disease is quite widely spread in Ontario.

Club Root is a very serious disease. It attacks cabbages, cauliflowers, turnips, radishes, kale and many Cruciferous weeds. The disease affects the roots and produces irregular thickenings and knob-like swellings which are sometimes the size of a man's fist. The tops of affected plants develop very slowly, cauliflowers and cabbages attacked forming little or no head. The plants are sometimes completely killed, due to the fact that the swellings on the roots prevent the proper absorption of water. The diseased roots finally rot and fall to pieces, liberating into the soil immense numbers of minute spores. The disease may remain in the soil for a number of years. It is chiefly spread in manure, in infected soil, and by means of diseased seedling stock. It is also thought that the disease may be spread by spores adhering to the seed.

A careful watch should be kept for Club Root in Ontario. All plants showing symptoms of the disease should be dug up and burned to prevent the soil becoming infected. In order to prevent the disease, use only healthy plants, do not use manure containing cabbage refuse, and disinfect the seed by soaking it for fifteen minutes in a solution of one part by weight of corrosive sublimate in 1,000 of water. If necessary to use infected land apply unslaked lime at the rate of 75 to 150 bushels to the acre in the autumn before before planting cabbages or turnips. It is claimed that if the lime is applied from two to four years before planting, the results are even better. Burn all refuse from diseased crops. Practice rotation of crops. It is claimed that the organism may remain in the soil for at least seven years. It is, therefore, advisable to drop Cruciferous crops from a four-year rotation. Do not use manure from stock fed upon diseased roots. Keep down weeds belonging to the mustard family; they may harbor disease.



Powdery scab on potatoes.

Powdery or Corky Scab of Potatoes.—This disease was discovered in Canada in 1912 by G. H. Gussow, Dominion Botanist, Ottawa, who reported it as

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being found in Prince Edward Island, Quebec, Ontario and Alberta. This fall potatoes badly attacked by Powdery Scab were sent to this department from Liskeard, Ontario. This is a disease which should not be allowed to become established in this Province.

Tubers attacked by Powdery Scab become covered with conspicuous scab spots which are more clearly defined, more elevated and smoother on the surface than the scab spots of common potato scab. A very characteristic greenish, dark powder may also usually be observed on the surface of the spots. In severe cases tubers may be much stunted and malformed, and are frequently gnarled and knobby and covered with deep scars.

The remedial measures recommended are the planting of potatoes free from any signs of scab, and as a safeguard disinfecting by soaking the tubers before cutting for two hours in a solution of formalin of the strength of one half pint of formalin to fifteen gallons of water or in a corrosive sublimate solution, one part by weight corrosive sublimate to two thousand by weight of water for three hours. This latter method is handy, as tablets can be obtained at any druggist's one of which dissolved in a quart of water makes a solution of the required strength. Corrosive sublimate, however, is deadly poison, and corrodes metal, and therefore must be used with caution. If a soil has once produced a crop of diseased tubers it will be infected, and hence seed treatment will be of no avail. Rotation of crops or seeding down to grass and clover for a number of years are therefore recommended in such cases.

Raspberry Yellows and Cane Blights.—These are two serious diseases of raspberries that are becoming prevalent in Ontario and about which very little is known. The writer has found Raspberry Yellows in the Niagara district and in gardens in Guelph. Canes attacked by Yellows have been sent to the Botanical Department from Green River, Stirling and Whitby, Ontario. It would seem therefore that Raspberry Yellows is pretty widely distributed in the Province. Cane Blight up to the present time has been observed only in the Niagara district.

The cause of Raspberry Yellows has not been determined. The name Yellows is given to this disease not because it is supposed to have any relation to Peach Yellows, but because it describes the appearance of affected plants in the advanced stages of the disease. The disease is reported by Professor Stewart of the New York Agricultural Station as being most destructive on Marlborough, but by no means confined to this variety. The writer has found Yellows attacking the King and Cuthbert.

The first indication of the presence of Raspberry Yellows is the curling downwards of the margins of the upper leaves which in the early stages are very dark green in color, but later become faintly mottled with yellow. As the disease progresses the plants become stunted, the leaves yellow, and the berries dry up without ripening or remain small and tasteless. The Yellows appears to spread from plant to plant in a patch, as correspondents report that they noticed only a few plants here and there in the rows the first season and the next season found a considerable portion of their plantation stunted and yellow.

No remedy or prevention for Raspberry Yellows is known. Spraying with Bordeaux mixture has been tried, but does not prevent the disease. As once a plant is attacked nothing can be done to save it, it is advisable to dig out and burn any canes showing signs of the disease. If these are left there is a danger

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that the other plants in the plantation will be rendered useless by the disease. Raspberry Yellows is a disease which requires careful investigation to discover the cause and means of preventing it.

Raspberry Cane Blight, while common in the Niagara district, has not become so serious or so widespread as to attract much attention as yet. It has been proved to be caused by the fungus *Coniothyrium fuckelii,* Sacc. It attacks both the red and black variety of the raspberry. In New York State it has been found that the Cuthbert, Marlborough, Ohio, Gregg and Kansas are varieties susceptible to Cane Blight, while Columbian is notably resistant.

The leaves and fruit on plants attacked by Cane Blight wither and dry up from the tops downward and the canes become brittle and easily broken. The diseased canes are easily seen in the rows and are often mistaken for those destroyed by the Snowy Tree Cricket or injured in cultivation. If the diseased canes are examined the bark is seen to be lighter in color and near the base will be found discolored, dead areas in which numerous black dots, the fruiting bodies of the fungus, can be seen. Frequently these diseased areas are discolored and smoky, due to the presence of immense quantities of exceedingly small spores.

Very little is known in regard to the control of Cane Blight. Results with spraying have not proved satisfactory, and the only practical methods of preventing the disease appear to be: First, to plant only healthy plants in setting out a plantation; second, to avoid planting where raspberries or other related plants have been grown: third, to remove and burn old canes immediately after the fruit is gathered.

EDIBLE AND POISONOUS MUSHROOMS.

By R. E. Stone, Ph.D.

Year by year the trees of the forest and the smaller plants in our fields and gardens build up large quantities of solid substances from the carbon dioxide in the air and a large part of this material is left behind in the autumn, as dead leaves, twigs, and stems, as the plants go into their winter's rest. If there was nothing to do away with this material the surface of the land would soon become so covered with the debris that plants would have no place or opportunity or space in which to grow.

There are however a number of agents which by their united action tend to reduce the amount of this debris. Animals consume large quantities of the plant material for food. Insects of various kinds live on this dead material. Fire destroys large quantities of it, but by far the most efficient agent in returning the leaves and other parts of plants back into soil are the fungi. These organisms are always busy forming new soil from the plant and animal debris laid down each year.

Among the most widely spread of these decay-producing organisms are the mushrooms and toadstools. By digging into the leaf mould the white threads of the mycelium or spawn may be seen running in every direction through the mass. In damp weather the fruit bodies appear suddenly before us and we have come to look upon the mushroom as a symbol of rapid growth and development. It is the fruit body of the decay-producing organisms that we usually consider as the mushroom, and it is the portion which is edible.

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Some people seem to thing that there are only a few kinds of these plants, but when we begin to study them we find that there is a vast number of kinds. **MacIlvain,** in his work on mushrooms, describes one thousand kinds or species in eastern North America, but he has by no means described them all. Some of these mushrooms are very small, some occur but rarely, some are tough and woody. But in this list of a thousand fungi over three hundred are known to be edible and less than twenty are known to be poisonous.

In order to distinguish the edible kinds of mushrooms from the poisonous ones, it is necessary to understand the structure of a mushroom.

The mushroom consists of a fleshy, more or less hemispherical cap or pileus on the under side of which are many thin plates standing side by side called the gills. The cap is carried up on a cylindrical stalk or stipe. In some cases we find the gills hidden in the young mushroom by a curtain or veil which stretches across from the edge of the cap to the stem. As the cap expands the veil may be torn away from the edge of the cap and form a ring on the stem, thus exposing the gills to view.

In the cultivated mushroom the gills are first white, turning to pink and finally becoming brown to nearly black in age. There are many edible mushrooms, however, in which the gills are permanently white.

The ordinary mushroom (*Agaricus campestris*) may be known by the following characters: The plant is white, showing tinges of brown on the cap and stem. The cap itself is fleshy, nearly spherical at first, with the edge of the cap attached to the stem by a veil. As the cap opens out it becomes hemispherical and finally flat-topped. The veil breaks away from the edge of the cap and remains behind forming a ring on the stem. The gills are first white, then pink and finally very dark brown. They are not attached to the stem but are free from it. The cap may be easily pulled away from the stem, leaving a socket-like pit into which the end of the stem fits. The stem itself is solid and cylindrical. At maturity the plant may be from 2-6 inches broad across the cap and may be from 2-5 inches high, the stem from 2-4 inches long by ½-¾ inches through.

The plant grows in meadows and pastures. We may expect to find it any time from spring until late in the fall.

It is this species of mushroom that is commonly cultivated, and although it varies greatly it is not easily mistaken.

Some other common edible mushrooms are the shaggy mane and the ink caps. These fungi are distinguished by their black gills, which melt down into inky liquid soon after the day begins to get warm. The shaggy manes (*Coprinus comatus*) are common on rich lawns and grass lands or often near old manure heaps. The ink cap (*C. atrimentarius*) grows in similar places, and may be found in suitable weather from spring until fall.

A smaller glistening ink cap very commonly forms dense clusters on stumps and logs and is also very palatable.

Another very common edible mushroom is the white mushroom, or smooth lepiote (*Lepiota naucina*). This plant resembles very much the ordinary mushroom except that it shows no tinges of brown and the gills are white, though sometimes pink in very old plants. The stem may become hollow in old specimens and usually slightly enlarged at the base.

Nearly every year we have reports of mushroom poisoning and the year 1912 witnessed a great deal of it. Mushroom poisoning may result from eating old fungi that have begun to decay slightly or from eating mushrooms that have been

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cooked for some time. For the most part, however, mushroom poisoning results from eating fungi that contains poisons at all stages of their development.

The poisonous mushrooms in this country are less than twenty in number. The two most common ones are the Fly Agaric (*Amanita muscaria*) and the Deadly Agaric or Destroying Angel (*Amanita phalloides*).

The first plant mentioned is a very handsome fungus. The cap is usually red or orange in color, becoming yellow or whitish in age. The cap is usually covered by numerous loose white scales and may be from 4-6 inches in diameter. The gills are white and remain so. The veil which at first hid the gills hangs down around the upper part of the stem like a white frill or ruffle. The stem is often an inch in diameter, and six inches long and pure white in color. It is enlarged at the base into a large scaly bulb and at maturity the upper part of the stem is hollow.

The Destroying Angel or Deadly Agaric (*Amanita phalloides*) is probably the most dangerous fungus we have, and, in this Province at least, has been the cause of most of the mushroom poisoning.

Some of the plants are brownish in color, but in a great many cases pure white, and resemble to some extent the white mushroom or smooth lepiote, for which it is perhaps mistaken.

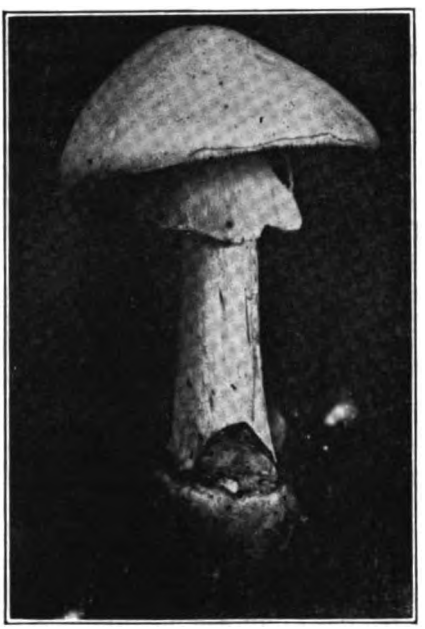

Photo by Prof. Geo. F. Atkinson.
DESTROYING ANGEL.
(*Amanita phalloides vai verna.*)

The plant is medium in size, three to four inches across the cap and four inches tall. The cap is usually somewhat conical and easily separated from the stem. The gills are white in color. The veil forms a ring on the stem high up just under the cap. The stem is slender, white and hollow, and from three to four inches long. At its base the stem is enlarged into an abrupt bulb which usually has several flaps of tissue standing up from its margin forming a sack-like structure sometimes called the poison cup. Many of these features are shown in the accompanying illustration.

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In the possession of the hollow stem, white gills, large ring, and the scaly bulb or sack at the base of the stem these plants can easily be distinguished from the ordinary mushroom. Besides, they grow in different places. The ordinary mushroom (*Agaricus campestris*) grows in grassy fields and meadows, while the two poisonous plants described grow in open woods or very near the edges.

RULES FOR DETERMINING POISONOUS MUSHROOMS. I find that there are a number of so-called "tests" which are more or less commonly applied for the purpose of detecting poisonous fungi. Chief of these are the "silver spoon test" and the "peeling test."

There is a supposition that if a silver spoon is placed in a dish in which mushrooms are cooking it will act as an indicator of the edibility of the plants. If the spoon turns black they are poisonous, if it remains bright they are edible. Where this test originated I am unable to say. However, it is sufficient to know that this test *cannot be relied upon.* The blackening of the silver is caused by the presence of free sulphur and *is no indication of the presence of a poison.*

We often hear of the peeling test. If the outer layers can be peeled off easily some people regard this as a sure sign that the mushroom is edible. As a matter of fact there are some poisonous forms which peel very readily also, so that this test *cannot be relied upon.*

There is no one rule which can be followed in collecting mushrooms, but the following set of rules will eliminate all of the poisonous ones.

Rule 1. Do not gather wild mushrooms in the button or unexpanded stage.

Rule 2. Do not gather mushrooms that show the slightest trace of insect work or decay.

Rule 3. Do not gather mushrooms having a scaly bulb or a sack at the base of the stem, especially if the gills are white.

Rule 4. Do not gather mushrooms having a milky juice unless the milk is reddish.

Rule 5. Do not gather mushrooms having thin brittle caps and gills of nearly equal length, especially if the cap is bright colored.

Rule 6. Do not gather tube bearing fungi if the flesh changes color when cut or broken, or if the mouths of the tubes are reddish.

Rule 7. Do not gather mushrooms having a cobwebby veil and clay-colored spores, especially if the cap is slimy when moist.

In gathering mushrooms from the fields, and more especially from the woods, extreme care should always be taken to determine the character of the base of the stem, especially if the gills are white. If the stem shows a scaly bulb or sack-like structure at its base the plant should be discarded.

In addition to the mushrooms which are edible, the puff balls, coral fungi, hedgehog fungi, fairy clubs, and morells are edible, and some of them are very delicious. The giant puff ball, which sometimes weighs ten pounds or more, is very good if it is gathered before it begins to turn brown inside.

If one feels inclined to make use of the wild mushrooms for food or food accessories, I would advise him to secure a book on mushrooms and learn to distinguish the different forms and then start with one or two easily recognized kinds. As time goes on and the collector learns to recognize the different species he can add new forms to his list, but in all cases he should proceed cautiously.

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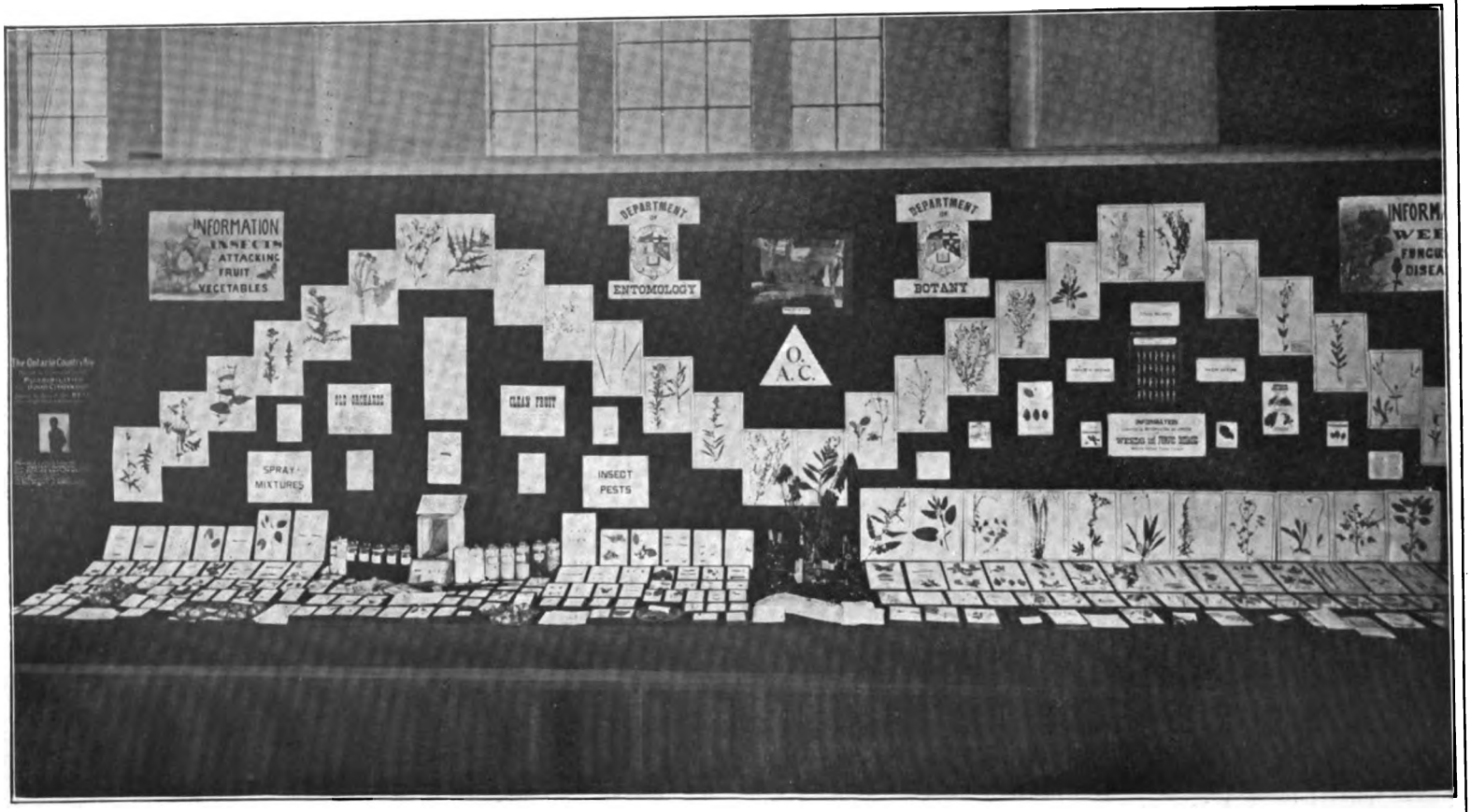

Educational Exhibit of the Departments of Botany and Entomology, at the Toronto National Exhibition, 1913.

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Information Bureau and Exhibits.

During the month of June an Information Bureau was maintained for the benefit of the farmers visiting the College. Information was given concerning the control of weeds, insects, fungus diseases and spray mixtures. Mr. Wright was in charge of the botanical work of the bureau and was kept busy identifying weeds and answering questions concerning their control.

Exhibits of noxious weeds, weed seeds and fungus diseases were also prepared for the Better Farming Special in June, the Toronto National Exhibition in September, the Oakville Fall Fair in October, and the Ontario Provincial Fair in December. This demonstration work now requires considerable time each year.

Investigation Work.

During the past two years the following research work has been carried on: Experiments in the destruction of weeds by chemicals, spraying to control late blight of celery, spraying to prevent rose leaf blotch, co-operative experiments in weed eradication, and studies of the life history of Sclerotinia cinerea, the fungus which causes brown rot of stone fruits. Brief reports of the results of these researches are included here.

Experiments in Spraying to Destroy Dandelions.

Spudding dandelions from the lawn is a laborious and unprofitable task. Some easier and more effective method has long been looked for. During the past three years the Department of Botany has been trying experiments in spraying with a solution of iron sulphate to kill dandelions in the lawn. The results obtained are much more promising than those secured by other experimenters in the United States. Last year's results are summarized below.

Only last year's results are cited but those of the two previous years are very similar though the data are not so exact. In last year's trials a twenty per cent. solution of iron sulphate was used. This was prepared by dissolving two pounds of iron sulphate in each gallon of water. This solution was applied with a knapsack sprayer in the form of a fine spray just after the first few dandelions in the plots came into flower. Forty-eight hours after the application of the solution the leaves of dandelions were found to be blackened and burned. The burned and withered leaves were raked off and the plots left for about two weeks when the dandelions were seen to be sending up new leaves. Another spraying was then given with the same results. A careful watch was kept on the plots and it was found necessary to spray them six times during the season in order to prevent the leaves getting a start.

This spring the plots were closely observed and the results of last year's spraying noted. Each plot contained 168 square feet. The dandelions in these sprayed plots and in the unsprayed check plot were counted; in plot No. 1 there were 130 dandelions; in plot No. 2, 141 dandelions and in plot No. 3, 91; in the check plot (unsprayed) there were approximately 8,400 dandelions. These figures show that over ninety per cent. of the dandelions in the plots were destroyed by spraying six times with a twenty per cent. solution of iron sulphate.

In these experiments no permanent harm was done to the grass. It looked blackened and discolored just after the spraying but in a few days was as green as ever. This spring the grass was greener and more luxuriant on the sprayed plots

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than on the unsprayed plot. It was, nowever, noticeable that the White Dutch Clover had almost entirely disappeared from the sprayed plots.

This summer last year's experiment was repeated on a larger scale. One-eighth of an acre in which dandelions were very thick was sprayed six times with a twenty per cent. solution of iron sulphate by disolving two pounds of iron fitted with a broadcast attachment was used to apply the mixture. In order to do the spraying very thoroughly it was found necessary to drive slowly and to go over the ground twice at each spraying. Forty pounds of iron sulphate to twenty gallons of water were used at each application. After the sixth spraying the few odd dandelions that continued to send up leaves were sprayed twice with a knapsack sprayer. The results so far are very satisfactory. At least ninety per cent. of the dandelions have been destroyed and the grass has not been injured to any extent beyond the destruction of the White Dutch Clover which is quickly killed by the iron sulphate. The sprayed area looked greener during the summer than the rest of the campus.

It should be mentioned that other experimenters both in the United States and Canada have not found iron sulphate satisfactory for the destruction of dandelions, but the results obtained by this department during the past three years warrant giving it a trial on lawns that are badly infested with dandelions. Prepare a twenty per cent. solution of iron sulphate by dissolving two pounds of iron sulphate in each gallon of water. Apply this solution with a hand sprayer or a watering can with a very fine rose, so that all the dandelions are thoroughly drenched with the solution. Rake off the blackened leaves two or three days after spraying and in dry weather, if possible, thoroughly water the lawn. Spray frequently enough during the season to prevent the dandelion leaves getting a start. Six applications at least will be necessary. Next season in order to fill up the space caused by the destruction of the dandelions re-seed with pure lawn grass seed. Prepare the lawn for re-seeding by raking it over with a coarse rake so as to stir up the soil. Sow the seed when the ground is moist, rake it in well and roll. There is nothing like a good thick stand of grass to keep our dandelions and other weeds.

Spraying with iron sulphate is not very expensive. The iron sulphate may be obtained retail for two or three cents a pound or wholesale at one cent a pound. Forty pounds or iron sulphate costing wholesale one cent a pound, will make twenty gallons of the solution which is enough to spray at least one-eighth of an acre so that if a lawn this size is sprayed six times during the season, the cost for the material will be only $2.40, if the iron sulphate is purchased wholesale.

Experiments with Lawn Silicate and Sulphatine.

These are two preparations which are recommended and sold for the destruction of weeds by the Superior Chemical Company, Louisville, Kentucky, United States of America. Samples of both of these preparations were sent to the department by the company to be tested and reported upon. The Lawn Silicate even when applied at twice the rate recommended in the directions supplied had absolutely no apparent effect either upon the weeds or the grass in the plots experimented with. It appeared to be entirely harmless and without any herbicidal action whatever.

Three spraying with strong Sulphatire (1 gallon to 25 gallons of water) killed Purslane, Lamb's Quarters, Common Plantain and Ribgrass growing among

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cobble-stones but failed to entirely destroy dandelions, knot weed and grass. It would seem therefore that the herbicidal action of Sulphatine is not sufficient to make it of much value in the destruction of the more persistent weeds.

Experiments in the Control of Late Blight of Celery.

A careful test was made to ascertain the value of Bordeaux mixture and lime-sulphur for the control of Late Blight of Celery. The variety of celery known as Golden Self-Blanching was selected on account of its susceptibility to Late Blight. Spraying was commenced when the celery plants were in the seed beds or just after they had been transplanted to flats and repeated at intervals of about ten days until a week before it was time to harvest the crop. Check rows of the same variety of celery were also planted. When the celery was dug a careful inspection was made. The plants of the unsprayed check rows were found to be quite badly attacked by the blight. Those in the lime-sulphur rows slightly injured and those in the rows sprayed with Bordeaux mixture practically free from blight, only a few of the outer leaves being attacked. A record was kept of the number of saleable bunches and the weight of celery harvested from each row. This is shown in the following table:

Number of row.	Variety of Celery	First spraying.	When transplanted to field	Fungicide used.	Saleable bunches.	Pounds of Celery.
1	Early Golden Self-blanching.	May 1st, just after plants were transplanted to flats.	June 3rd.	Bordeaux mixture.	220	385
2	" "	Check unsprayed.	" "	Check unsprayed.	197	338
3	Late Golden Self-blanching.	" "	June 26th.	" "	250	380
4	" "	May 1st, when plants were still in the seed bed.	" "	Concentrated lime sulphur. Strength—Specific gravity, 1.008.	224	312
5	" "	" "	" "	Bordeaux mixture (4.4.40 formula).	267	315
6	" "	" "	" "	" "	265	347

All the rows were 130 feet long. Rows Nos. 1 and 2 were Early Golden Self Blanching celery, while rows Nos. 3. 4, 5 and 6 were Late Golden Self-Blanching celery. The results would have been much more marked in favor of rows 5 and 6 sprayed with Bordeaux mixture but for the fact that from one-quarter to one-half of the bunches had to be discarded on account of hollow stems due to poor seed.

The results of this experiment indicate that loss from Late Blight of Celery can be prevented by spraying with Bordeaux mixture, starting when the plants are in the seed beds and spraying at intervals of ten days or two weeks throughout the season. Lime-sulphur does not appear to be as effective as Bordeaux mixture

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in the control of Late Blight of Celery. This experiment will be continued next year, and an attempt made to ascertain the exact financial gain or loss due to spraying.

Spraying Experiments to Prevent Rose Leaf Blotch.

Rose Leaf Blotch caused by the fungus *Actinonema rosæ* is a disease about which many complaints are received each year. It damages roses both under glass and in the open. It produces circular black or brown spots upon the leaves which often spread and run together, so that nearly the whole leaf is discolored. In severe attacks the lower leaves are often almost wholly destroyed, and fall to the ground. Spraying with Bordeaux mixture and lime-sulphur is recommended to prevent this trouble. In order to test the efficiency of Bordeaux mixture and lime-sulphur in the prevention of this disease the following experiment was made during the past season.

Nine rows of mixed varieties of roses were selected. Three were sprayed with lime-sulphur, three with Bordeaux mixture and three were left unsprayed. The first spraying was done on the second of May before the plants were in leaf. At this time concentrated lime-sulphur, strength specific gravity 1.015 was used on the lime-sulphur rows. In subsequent spraying the strength of the lime-sulphur was reduced to specific gravity 1.008. Standard Bordeaux (4.4.40) was used for all the sprayings of the Bordeaux rows. Spraying was repeated about every ten days from the second of May until the twelfth of June when the roses began to come into flower. No spraying was done from the twelfth of June until the fourth of August when spraying was commenced again and continued at intervals of about ten days until the fifteenth of September.

On the thirtieth of July the leaf blotch was found in comparative abundance on the unsprayed rows. It was quite marked on the rows sprayed with Bordeaux but there was practically none on the lime-sulphur rows. On the twenty-fifth of August plants in the Bordeaux rows were found to be badly attacked by the leaf blotch. Those in the unsprayed rows still more severely attacked while those in the lime-sulphur rows were comparatively free from the disease. This experiment, though by no means conclusive, indicates: First, that spraying with Bordeaux mixture ten times during the season will not prevent damage from the Rose Leaf Blotch. Second, that spraying with lime-sulphur ten times during the season will prevent serious damage from Rose Leaf Blotch, but will not entirely prevent the disease. Third, that lime-sulphur is more effective than Bordeaux mixture in the control of Rose Leaf Blotch.

Co-operative Experiments in Weed Eradication.

This is a new line of experimental work commenced last year, 1912. The object of this work is to have carried on by men on their own farms experiments in the eradication of weeds, the results of which will furnish data from which definite statements may be made regarding the best methods of controlling the various bad weeds. At the present time it is very hard to get any two men to agree as to which is the best way of dealing with any particular weed. Then again a man may have tried a method of eradication on one kind of soil and found it satisfactory and recommended it, and it may not be a suitable method for some other kind of soil. Without illustrating further it is sufficient to say that we have very little definite knowledge concerning the eradication of weeds, and hence the necessity for such experiments.

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In starting this work it was thought wise to confine our attention at first to four of the common troublesome weeds. If the experiments progress satisfactorily it is hoped to add more bad weeds from year to year until exact information has been obtained about the eradication of most of the worst weeds of Ontario. The weeds selected for the experiments in 1912 and 13 were Perennial Sow Thistle, Twitch Grass, Bladder Campion and Wild Mustard. Six experiments in all were outlined namely: The Use of Rape in the Destruction of Perennial Sow Thistle; a System of Intensive Cropping for the Eradication of Perennial Sow Thistle; The Use of Rape in the Destruction of Twitch Grass; a Method of Cultivation and Cropping for the Extermination of Twitch Grass; a Method for the Eradication of Bladder Campion; Spraying with Iron Sulphate to Destroy Mustard in Cereal Crops.

During the past two seasons, some twenty-nine farmers co-operated in this work, including six district representatives. Summarizing the reports received, it is found that four men tried experiment No. 1, The Use of Rape in the Destruction of Perennial Sow Thistle; three found the method entirely successful; one only partly successful. Five men tried experiment No. 3, The Use of Rape in the Destruction of Twitch Grass; four reported complete success, one only partial success. Five men tried experiment No. 4, a Method of Cultivation and Cropping for the Extermination of Twitch Grass; three secured satisfactory results, two found the method not completely satisfactory. None, however, had completed the experiment when they made their reports. Two men tried experiment No. 5, a Method for the Eradication of Bladder Campion; both reported success with this method. Twelve men tried experiment No. 6, Spraying with Iron Sulphate to destroy Mustard in Cereal Crops; all reported that they found that this method gave good results. A full account of these co-operative experiments will be found in the reports of the Ontario Agricultural Experimental Union for 1912 and 13.

Notes on the Apothecial Stage of Sclerotinia cinerea in Ontario.

This fungus was known as *Monilia fructigena,* Pers. until placed in the genus Sclerotinia by Woronin in 1899. Recent investigations show that the American Brown Rot fungus of stone fruits is not identical with *Sclerotinia fructigena* occurring in Europe on pome fruits. It agrees more closely with *Sclerotinia cinerea,* and should be referred to that species. In the spring of 1902 Norton found the apothecial stage in abundance in peach and plum orchards in Maryland. In 1906 this stage was reported as being very common in the United States throughout the West. Up to the present time, however, pathologists have not regarded the apothecial stage of importance in the propagation of the fungus. Conidia adherent to bark or bud scales and the mycelium of the mummied fruits or blighted twigs have been considered to be the chief sources of infection. While these are undoubtedly important sources of infection, observations made by the writer during the spring of 1912 point to the possibility that in wet seasons the apothecial stage may be of primary importance in the dissemination of the fungus and the chief source of blossom infection.

In the course of some studies on the life history of *Sclerotinia cinerea* a careful watch was kept for the appearance of the apothecial stage. On May 25th, 1912, Mr. W. A. McCubbin, my colleague in this work, found numerous apothecia under wild plum trees (*Prunus americana*) at Cedar Mills, Ontario. The soil in this locality is a sandy loam. Apothecia were produced from old plums buried

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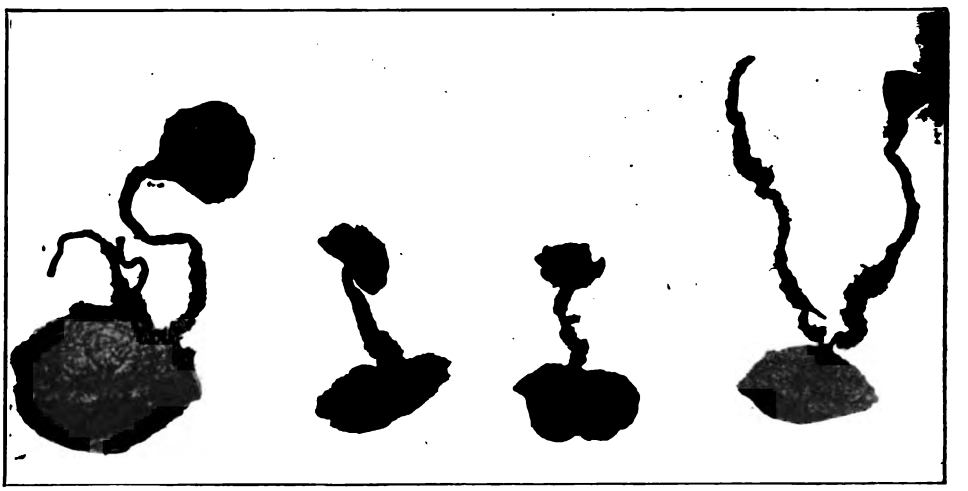
from one to two inches in the sand and leaves. These old plums had evidently been buried for some time in the soil as last year's plums were still on the surface of the ground. When the apothecia were gathered it was observed that the asci in the more mature ones were discharging their spores. The blossoms at this time had nearly all fallen.

On May 29th the writer paid a visit to Fruitland in the Niagara district. Ontario, in search of the apothecial stage. A well-cultivated plum orchard (chiefly Lombards) was visited. The soil was a fairly heavy clay loam. Numbers of apothecia were found growing from Sclerotia in old dried mummied plums covered by moist earth or lying on the surface of the ground in low spots where water had lain for some time. A closer examination revealed the stipes of numerous apothecis that had evidently withered up as soon as the mummied fruit from which they were growing had been dried up by the sun. In another plum orchard, the soil of which varied from clay loam to light sandy loam, many more apothecia were observed, and countless withered stipes indicated how prevalent the apothecial



Apothecia of Sclerotinia cinerea, from Mummied Plums.

stage had been. When the apothecia were disturbed, the spores were discharged in fine brown dust-like clouds. The petals by this time had nearly all fallen but most of the calices were still intact.

A peach orchard on light sandy loam was next inspected. In this orchard a heavy cover crop of winter rye was growing. Very few mummied fruits were found on the surface of the soil. A number of apothecia were found, however, growing from the mummies buried in the sand. These were most abundant where the cover crop was heaviest and the soil dampest.

This was the first time that the apothecial stage has been observed in Ontario. The continual wet weather during May without doubt accounted for the abundance of this stage of the fungus. It was observed that the apothecia were not produced except after heavy rains and that they dried up, and disappeared within a few hours after the weather became dry and warm. The very brief duration of the apothecia probably accounts for the fact that this stage has not been more generally observed by pathologists.

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On the same dates that the apothecia were found in such abundance, mummied fruits and blighted twigs were examined to see if the mycelium was producing spore pustules. Though large numbers of mummies and twigs were examined none showed any signs of spore pustules. These were not observed until a much later date. As the blossoms had nearly all fallen at this time, it would appear that the source of blossom infection is either condia adherent to the bud scales or the apothecial stage produced from mummied fruits beneath the trees. It would seem from the observations made that large numbers of apothecia are produced in wet seasons and that the asci discharge immense numbers of spores during the blossoming period. It is therefore reasonable to suppose that the apothecia are one of the chief sources of blossom infection which later may result in twig blight. It is also possible that the ascospores account for much of the infection of the young fruit. It also seems likely that the apothecia are produced in more or less abundance every spring but as they wither very quickly when the weather becomes dry they have not been observed and hence the apothecial stage has been regarded of little importance in the propagation of the fungus, and the continuance of the disease.

The writer hopes to continue these observations, as it is desirable to ascertain definitely the extent of the infection due to the production of apothecia in order that proper measures may be recommended for the control of this disease. Plowing under the mummied fruits has hitherto been considered one of the best means of preventing infection; but if the apothecia are produced from old fruits which have been buried a year or more in the soil and brought to the surface by fresh plowing, this method would appear to be of little value.

Observations on this fungus were continued this spring, 1913. The apothecial stage was found in comparative abundance in plum orchards near St. Catharines. In order to determine whether the apothecia developed from mummied plums which had been buried in the soil for a year or more or from mummied plums of the previous season, a number of mummied plums gathered in the spring of 1912 (the plums having been destroyed by the Brown Rot during the summer of 1911) were buried in loam and sand at different depths and left outside exposed to climatic conditions until this spring, 1913. They were then dug up and placed in moist chambers. Not a single apothecium developed from any of them nor were there any signs of the formation of sclerotia. Some mummied plums gathered this spring which had hung on the trees or lain on the ground under the trees for the winter were placed in moist chambers at the same time. On one mummied plum which had lain on the ground over the winter, a number of stunted, poorly-developed apothecia appeared. This experiment, though by no means conclusive, suggests that the apothecia may be developed from mummies of the previous years. These experiments and observations will be continued with the hope of clearing up this and other obscure points in the life history of *Sclerotinia cinerea*.

Herbarium.

Considerable time has been spent during the past year on remounting and placing in the herbarium the rarer specimens of plants from the extensive collection presented last year by Mr. N. H. Cowdry of Waterdown, Ontario. These have helped to fill in gaps and made the College collection more complete.

A considerable number of new specimens have been added to the College collection. While in the Canadian Rockies this summer the writer had an op-

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portunity of collecting some of the rarer alpine plants. These have been placed in the herbarium. Dr. Stone has continued his studies and collections of the Fleshy Fungi and has added many species new to the College collection. Lists of the new specimens are here appended.

FLOWERING PLANTS ADDED TO THE HERBARIUM, 1913.

Thalictrum venulosum, Trelease.
Anemone patens, L.
Erysimum parviflorum, Nutt.
Oxytropis Lamberti, Pursh.
Spirea corymbosa, Watson.
Agoseris cuspidata (Pursh), Stend.
Lactuca pulchella (Pursh) D. C.
Cirsium altissimum, L.
Prenanthes racemosa, Michx.
Gentiana acuta, Hen.
Mimulus Lewisii, Pursh.
Agastache foeniculum (Pursh), Ktsje.

FLESHY FUNGI ADDED TO THE HERBARIUM, 1913.

Peziza tuberosa, Bull.
Armillaria mellea, Vahl.
Clitocybe laccata, Scop.
Clitocybe candicans, Fr.
Cantharellus aurantiaca, Fr.
Russula delica, Fr.
Russula roseipes, Bres.
Lactarius volemus, Fr.
Hygrophorous conicus, Fr.
Marasimus siccus, Schw.
Lentinus tigrinus, Fr.
Inocybe cincinnata, Fr.
Galera crispa, Longyear, Pk.
Crepidotus fulvotomentosa.
Hebeloma crustiliforme, Bull.
Flammula flavida, Schaeff.
Pholiota praecox, Pers.
Pholiota marginata, Botsch.
Naucoria pediades, Fr.
Pilosace eximia, Pk.
Panaeolus reterugis, Fr.
Panaeolus solidipes, Pk.
Psathyra gyroflexa,
Hypholoma appendiculata, Bull.
Hypholoma incertuum, Pk.
Lentinus lepideus, Fr.
Lentinus vulpinus, Fr.
Lentinus maximus, Johns.
Lentinus underwoodii, Pk.
Panus stipticus, Fr.
Panus rudis, Fr.
Schizophyllum commune, Fr.
Entoloma rhodopolium, Fr.
Pluteus cervinus, Schaeff.
Leptonia asperella, Fr.
Claudopus nidulans, Pers.
Clavaria stricta, Pers.
Hydnum septentrionale, Fr.
Formes roseus (Alb. & Schw.) Cooke.
Fomes populinus (Schum) Cooke.
Fomes pinicola (Swortz) Fr.
Fomes salicinus (Pers.) Fr.
Irpex tulipifera, Schw.
Irpex sinuasus, Fr.
Corticium cinereum, Fr.
Corticium lacteum, Fr.
Ganoderma lucidum (Leys) Kaist.
Ganoderma tsugae, Murrill.
Polyporus squamosus, Fr.
Stereum fascicatum, Schw.

In conclusion it gives me pleasure to acknowledge the faithful and efficient service rendered to the department by my colleagues, Dr. R. E. Stone and Mr. W. H. Wright.

Respectfully submitted,

J. EATON HOWITT.

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PART VI.

THE PROFESSOR OF PHYSICS.

To the President of the Ontario Agricultural College:

SIR,—I have the honour to submit my eighth report as head of the Department of Physics.

INSTRUCTION.

The instructional work of the Department has covered the same lecture courses and laboratory practice as in past years.

PROTECTION AGAINST LIGHTNING.

After instruction to the students possibly the most important work of the year has been the settling of the long standing problem as to the efficiency of lightning rods. Properly installed they are almost absolute protection. Out of every thousand dollars worth of damage done to unrodded buildings by lightning $999 would be saved if those buildings were properly rodded. A pretty strong statement, you say. We realize that it is strong. It has taken thirteen years of investigation to compile data that enable us to make that statement to-day.

Fig. 1.—Drainage Picnic at Tara.

You will remember that away back in 1901, when Prof. Reynolds was head of the department of English and Physics, he began to investigate the subject of lightning rods. Five years later, when two departments were formed of one, and he chose the department of English, leaving me the department of Physics, I thought I could not do better than continue the work so ably begun. To-day, after eight years further study added to the five we have the problem completely solved.

A bulletin has been issued on the subject, entitled Lightning Rods, their Efficiency, Principles and Installation on Farm Buildings.

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Practical Drainage Demonstrations.

The plan inaugurated last year of conducting practical drainage demonstrations with the College ditcher has been continued. The sites for these have been chosen in those parts of the Province where, for some reason or other, underdrainage is practically unknown.

Bruce County. The first of these demonstrations was reported a year ago. It was held near Tara, in Bruce County. In July, 1913, a drainage picnic was held to view results. Figure 1 shows a portion of the picnic crowd. Figure 2 shows the field in front of the picnic grounds, producing its first crop, though cleared for fifty years or more. The far side of the field was drained, but the drainage reclaimed even the near side sufficiently to produce the crop of oats shown. On another section of the plots barley was sowed on both drained and undrained portions. The crops on the drained part showed marked superiority over those on the undrained.

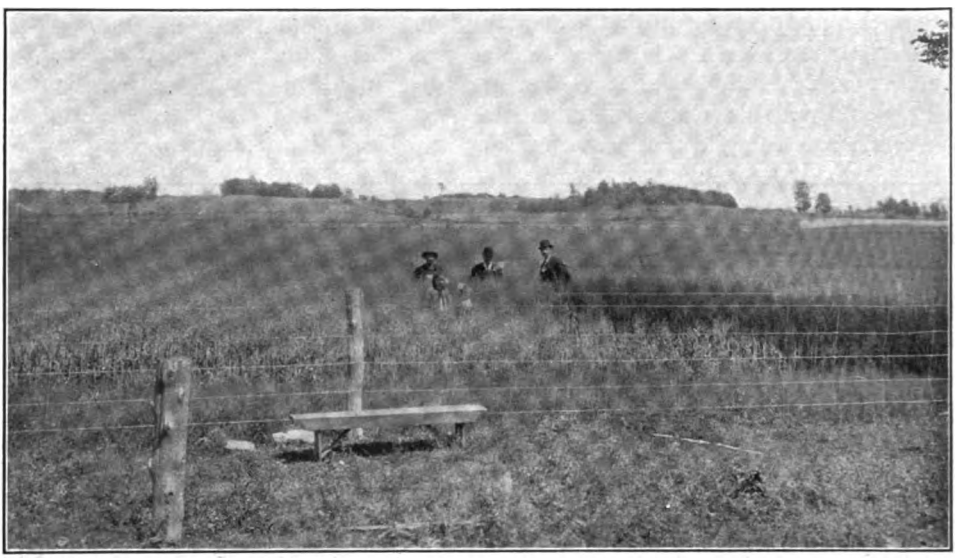

Fig. 2.—Prize Crop of Oats on Tara Drainage Demonstration Plots; the first grain crop on the field, although cleared for fifty years.

Haldimand County. In 1912 several plots were selected in various parts of Haldimand County. It was first intended that the department should provide the tile, dig the trenches and lay the tile, the farmer hauling them and filling the trenches, but during the autumn and winter we became convinced that as a matter of policy it would be better to have the farmer financially interested in the experiment by paying for the tile. Under this change all but two owners of plots selected withdrew. These were Mr. Albert Snell, of Hagersville, in the Township of Walpole, and Mr. Stephen Culver, of Rainham Centre, in the Township of Rainham. About seventy-five people witnessed the demonstration at Mr. Snell's, and about sixty at Mr. Culver's. On each farm a field of approximately ten acres was selected, half of which was drained, the other half being left undrained for comparison. Different depths and different distances apart were tried in each plot. Half was drained two feet deep and half three feet, and half the drains of each depth were placed two rods apart and half four rods.

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It will be remembered that it was the people of Haldimand County who caused us to launch this machine demonstration work, for after seven years of active drainage campaign we had made no impression in that County. Times without number Haldimand people met us with the statement that the clay of which their farms were made was so stiff it would not let water down to the tile. Argument was useless, they would answer "facts is facts (with apologies to Mark Twain), we know what we have seen." Despite these statements they all have drains from their cellars, and they explain the presence of water in the cellars by saying "it soaks in," thereby providing sufficient answer to their former statement: If water will soak into their cellars, why will it not soak into tile drains?

On investigation we found an occasional drain in Haldimand. On Mr. Robert A. Suitor's place about three or four miles south of Cayuga I saw a field with two or three drains through some hard clay ridges between some ponds that he had drained. Alfalfa had been sowed in the field a few years ago, but on those ridges it was all killed out except at the drains. There the stand was splendid for twenty to thirty feet on either side of the drains. As I related this to two meetings of Haldimand farmers, some of them claimed that Mr. Suitor "Has no clay on his farm." Prejudices surely die hard.

But to return to Mr. Snell and Mr. Culver. About the first of November I wrote them asking whether by any chance the water had found its way to their tile. Mr. Snell replied on the evening of November 10th. Our records show rain on the 7th, 8th, 9th and 10th, totalling about an inch. Here is Mr. Snell's letter:

"Yours of recent date to hand *re* drains. I would say that the tile were running nearly full the first big rain, and this morning they were running nearly full. I have the field plowed and do not see any water standing, so I guess it must be getting down."

Yours truly, ALBERT SNELL.

Four days later, during which time there was no further rain, Mr. Culver wrote saying that there was still enough water from the outlet to fill a two-inch pipe. Here is his letter:

"In reply to your letter, I am glad to satisfy your mind as to that beautiful texture of clay of ours by saying that water *has* been running from the outlet. I am just plowing it now, and to-day it was running about what would carry through a 2-inch pipe. The cross furrows had not been run out since the trenches were filled and the last few days water has been standing back of the trenches. To-day the piece is about plowed and ditches cleaned so that no water is standing over the trenches. I will have a better idea after now of where the water comes from, as it is possible that only that directly above the trenches or tile has found its way into the tile. The water has been running out different times, but I never went to see, only people told me so who passed along the road. They just look, but don't argue. Will write again."

Yours truly, STEPHEN CULVER.

I expect the answer now will be, "O yes, the water will find its way down while the earth is loose over the tile. But just wait till it gets thoroughly packed down again." We are quite content to wait, but in the meantime beg to remark that the clay over these drains will never be as compact again as it was before the machine cut through.

Mr. H. M. King, the Haldimand District Representative, has co-operated with us since going to the County, and the plots will henceforth be under his supervision.

Peterborough County. From Haldimand the machine was shipped to Peterborough County, where a demonstration was held on the farm of Messrs. Sandy and Beecher Matchett, four miles south of the City of Peterborough. During the

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first day of operation 40 visitors saw the work, during the second day 100, and at the meeting 150. Besides these quite a number inspected the work during the days succeeding the public demonstration.

These lands were of an entirely different nature from those in Haldimand, being quite sandy, with an impervious clay subsoil which during wet weather holds the water, saturating the sand and making it almost unworkable. One of these fields has not borne a crop in ten years. Drainage gives surprising results in soils of this nature.

Lennox and Addington. Two demonstrations were next held in Lennox and Addington, one at Mr. Harry Hunter's, just outside Napanee, and one at Mr. A. N. Lapum's, at Centreville. Mr. Hunter's field has been giving fair crops, but

Fig. 3.—Practical Drainage Demonstration at Mr. G. W. Lloyd's, near Belleville.

is known to be altogether too wet in many seasons. It is a clay or possibly clay-loam. Mr. Lapum's is a muck field, with clay subsoil, which has never given a satisfactory crop. The tile were laid in the clay. Cement tile were used in both these plots. About 200 people were in attendance at the former demonstration, and probably 300 others dropped in from time to time, and at the latter 160 at the public meeting, and 100 casual visitors.

These plots are now in charge of Mr. G. B. Curran, the District Representative, who was instrumental in having these demonstrations held.

Hastings.—One demonstration was held on the farm of Mr. S. W. Lloyd, near Belleville. Figure 3, shows this demonstration, the speaker being J. W. Johnson, M.P.P. This demonstration was also honoured by the presence of Mr. Charles Dorner, of Geneva, Switzerland, who spent some time in this country studying our drainage methods. He addressed the meeting for a few minutes. 100 in attendance.

Mr. A. D. McIntosh, the District Representative for Hastings, co-operated in this county, and the supervision of the plots is under his charge.

Grey.—In co-operation with Mr. H. C. Duff, of Markdale, one demonstration was held at Dundalk, on the farm of Mr. Walter Carson. About 200 were in attendance.

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Drainage Surveys.

The number of applications for drainage surveys was not as great this year as for some years past, consequently we were able to more nearly cope with the demand than in former years. Last year we held over 137 applications, this year we are holding over only 43, the smallest number held over since the active survey campaign began. We commenced the season with ten fieldmen, as in former years, but two of these quit about the middle of the season, so the number of surveys is less and the acreage less than they have been any year since the annual appropriation of $4,000 was granted for the survey work.

Table No. 1 gives a summary of the surveys made since the inception of this work.

Table No. I.—Summary of Survey Work of the Department of Physics.

Year	Appropriation.	Applications.	Surveys.	Applications held over	Acres surveyed.	Miles of drain.	Demonstrations. No.	Demonstrations. Average Attendance
1906	Nil	15	15	.....	500	45	.....	.....
1907	Nil	126	70	56	3,500	350	.....	.....
1908	1,000	166	100	66	5,000	510	43	.....
1909	1,000	302	179	121	5,157	613	48	18.0
1910	4,000	518	383	135	14,672	1,800	132	23.6
1911	4,000	414	327	87	15,211	1,864	142	17.4
1912	4,000	430	293	137	17,212	2,278	70	21.7
1913	4,000	290	247	43	13,705	1,713	56	20.3
Totals	.....	.....	1,614	.....	74,957	9,173	491	.....

As in former years we have held survey demonstrations in all localities where such demonstrations have not previously been held. The average attendance was 20.3, which is practically the number we go after, as each application in a new locality must bear twenty names before being accepted. These twenty are notified of the demonstration.

Draining on the College Farm.

Before the traction ditcher was taken down to Haldimand in the spring, we drained a portion of the "Puslinch field." These drains were put in at various distances apart, and various depths. Sand traps were put in at frequent intervals so the drains can be examined. It is hoped to secure from these experimental drains some important data as to the action of drains, the quantity of water that drains away, etc.

Since the machine returned from the Dundalk demonstration a large main of 14 inch tile has been laid from the west corner of the orchard across the field opposite the campus and emptying into a creek in Mr. Moore's field north-west of College Avenue West.

Cement Tile.

The main just referred to is worthy of note in more respects than that of size. The tile are of cement, the first cement tile drain at the College farm. For a number of years we have been investigating cement tile, and we have come

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to the conclusion that cement *properly made* and *properly cured* should prove durable in soils that are not acid or alkaline.

By "properly made" we mean of a strength not weaker than 4 to 1, good cement, thoroughly mixed, made as wet as the machine will work, and firmly packed. By "properly cured" we mean not allowed to dry out rapidly during initial set, kept moist for a week and then subjected to weather conditions until the tile are strong enough to handle without serious breakage. Steam curing is even better.

It has been claimed by some that cement tile would dissolve, at least the cement would, leaving a streak of sand. The investigations that led us to believe that such is not the case in ordinary soils were outlined in last year's report. Further investigations have been conducted since then as to strength and porosity of tile, not only cement, but clay tile as well.

TILE INVESTIGATIONS.

Strength of Tile.

In July, 1912, we made by hand 5,000 3-inch and 1,000 4-inch cement tile on the Farmers' Cement Tile Machine, which is a "hand machine." These were made as carefully and as well as we could make them. They were shaded from sun and sheltered from wind during first 24 hours, so that the "initial set" was as good as possible. They were watered a week after being made and then stacked outside and allowed to cure during the remainder of the year. In January, 1913, forty tile of each size were broken in a crushing machine specially designed for the purpose. It was found that the average breaking stress of the 4-inch cement tile was 837 pounds. In making this test the tile were laid on one plank, another plank was placed on top of them and the pressure applied to this top plank by means of a lever, so that the pressure did not act all around the tile, but simply on the highest and lowest lines. In this position, it took, as already noted, nearly half a ton to break the 4-inch tile. The lowest breaking stress for any tile was 561 pounds and the highest 1,435. The average thickness of these tile was 21/32 of an inch, their length 12.4 inches, and their weight 7 pounds 14 ounces.

By way of comparison forty 4-inch clay tile made at Port Dover were also tested. The average breaking stress was 1,170 pounds or 333 pounds more than the average of the cement tile. The lowest breaking stress on the Port Dover clay tile was 663 pounds and the highest 1,597. The average thickness was 20/32 of an inch, being 1/32 less than the cement tile, the average length 12.67 inches, and the average weight 7 lbs. 5 oz.

The Port Dover tile being considerably thicker than some other makes of clay tile, it was decided to test some thinner ones, known to be giving good satisfaction: consequently thinner samples were procured from Kingsville, in Essex County. The average thickness of these tile was 15/32 of an inch, or exactly ¾ the thickness of the Port Dover samples, and the average breaking stress was 827 pounds.

The length of these tile was 11.9 inches and the weight 5 lbs. 3 oz. The lowest breaking stress was 663 lbs., and the highest 950 lbs.

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The average breaking stress of the cement tile was 10 pounds more than that of the thin clay tile. It will also be observed that the lowest breaking stress in any cement tile was 102 pounds less than the lowest breaking stress of a Port Dover or Kingsville clay tile. Now, just what the minimum stress allowable is we are not able to say, but one thing is certain, namely, that any of the clay or cement tile tested were strong enough to stand up against the earth pressure to which they would be subjected if placed in the ground. The lowest breaking stress applied along the top line of the tile was somewhat over 560 pounds, but, if the pressure was applied all around the tile as it is in the earth, it would undoubtedly take considerably greater stress to break this tile.

At a depth of 3 feet when the soil is so wet that it will flow like quicksand, the greatest possible pressure on the 4-inch tile is about 200 pounds on the whole

Fig. 4.—Illustrating method of finding porosity of tile. Two samples of tile suspended over water in beaker.

upper surface of the tile, while the weakest tile tested required nearly three times this amount applied along one line to crush it. As a result of these tests of 4-inch tile we have come to the conclusion that the weakest of them were much stronger than is necessary to withstand the greatest pressure to which they would be subjected in soil conditions.

We next tested the breaking stress of some power made cement title manufactured at Woodstock, the average thickness of which was 18/32 of an inch. They were thus a little thicker than the Kingsville clay tile, but thinner than those from Port Dover and also thinner than those made on the Farmers' Cement Tile Machine. The Woodstock tile was made of crushed stone and cement in proportion of 4 to 1 on December 4th. They were given 48 hours steam curing, and afterwards piled outside until January 16th, when they were shipped to us. From then until February 24th, when they were tested, they were piled inside. Thus

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they were about 2½ months old, but during half the time they had been kept dry inside, during which little curing took place. Their average strength was 791 pounds. The weakest tile requiring 543 pounds pressure and the strongest 956. However, only half of these tile were broken on February 24th, the remainder were put in a trough of water where they were left for three weeks, at the end of which the average strength was 904 pounds, showing an increase in strength of 113 pounds. The weakest tile now required a pressure of 663 pounds to break it and the strongest 1,079.

Other sizes of both clay and cement were tested giving about the same comparative results. By these tests of breaking stress we have established a second

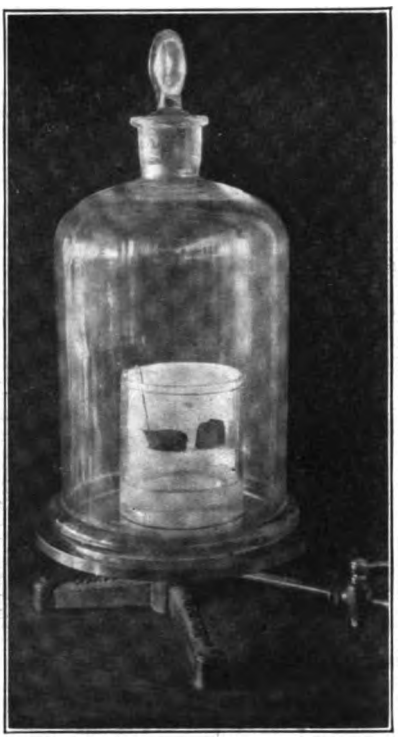

Fig. 5.—Samples of tile under receiver of air pump. Air being exhausted from the receiver.

point regarding cement tile, namely, that if properly made and properly cured they are as strong as some well known and satisfactory makes of clay tile. Hence we must conclude that cement tile thus made and cured are strong enough for tile drainage purposes.

Porosity of Tile.

"Are cement tile as porous as the clay tile? Will they let water through them as well as the clay? What is the porosity of clay tile anyway?" So frequent and insistent have been these inquiries since cement tile began to be used for underdrainage purposes in Ontario that we were led last winter to make a general study of the porosity of tile.

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The first problem that confronted us was to determine a method of finding *correctly* the porosity of a tile. We knew that for comparison of porosities a method in rather general use was to determine the per cent. of water by weight that the different tile would absorb when immersed in a trough or other vessel, from which it was an easy matter to determine the *volume* of water absorbed, and comparing this with the volume of the wall of the tile to arrive at the apparent porosity. But, when we put a tile in water to soak, does the water fill all the pores? If not, *i.e.*, if the air in some of the finer pores does not escape, then the porosity determined by the above method is incorrect.

To test this out we proceeded as follows. 1st. We took three whole tile, Port Dover make, dried them to constant weight and determined the volume of the tile wall, the volume of water absorbed and from that calculated the apparent porosity by this formula:

Fig. 6.—When the air is exhausted the receiver is jarred, and the samples drop down into the water.

$$\text{Per cent of pore space} = \frac{\text{Volume of water absorbed}}{\text{Volume of tile-wall}} \times 100$$

The average porosity of the three tile by this method was 29.6 per cent.

2nd. We took from each tile, lengthwise, four small samples, about one-half inch square and two inches long. We dried them to constant weight, and weighed them. Then we fitted a beaker with two small wires hung down inside about an inch from the top. In the beaker we placed about an inch of water. The sample of tile were then laid on the wires in as unstable a position as possible, see figure 4,

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and the beaker, placed under the receiver of a strong air pump and the air exhausted from the receiver, figure 5. Thus the samples of tile were in almost a perfect vacuum, and hence the air was almost entirely exhausted from the pores. When the vacuum was as complete as the pump would make it, the receiver was jarred sufficiently to dislodge the samples from the wires and allow them to drop down into the water, see figure 6. There being practically no air in the pores, the water would fill them completely. The samples were next removed, all adhering water dried from their surface by faint touch of a blotting paper, and the samples again weighed. The difference between this and the original weights gave the weight of water absorbed, from which the volume of water was known.

With the pores of a sample completely full of water it was an easy matter to find the volume of the sample. Being long and narrow it could be slipped down into a narrow graduated tube containing water. By the rise of the water in the tube the volume of the sample could be read directly on the graduated glass. Or the volume might be determined by weighing the wet sample in air and then in water. The percentage of pore space was then calculated as before. The average porosity of the three tile by this method was 35.7, much higher than by previous method.

3rd. Still another method of finding the pore space was used. Knowing the weight of the dry samples used in method No. 2 and the volume, the apparent specific gravity was determined by dividing thus, apparent specific gravity= $\frac{\text{weight}}{\text{volume}}$. The samples, after being dried again, were ground to a very fine powder. and the *real* specific gravity of the powder determined by means of specific gravity bottle. The pore space was then calculated from the two specific gravities by the formula:

$$\text{Pore space (per cent)} = \frac{\text{real}-\text{apparent}}{\text{real}} \times 100$$

The average porosity of the same three tile by this method was 35.0 per cent., very close to the result by method No. 2.

TABLE II.—Showing Comparison of Results by Different Methods of Determining Porosity.

	Porosity by absorption in atmosphere.	Porosity by absorption in vacuum.	Porosity by specific gravity method.
Tile No. 1	30.5	37.8 (four samples)	35.7 (four samples)
Tile No. 2	29.8	33.6 "	34.2 "
Tile No. 3	28.6	35.7 "	35.2 "
Average	29.6	35.7	35.0

From this it is seen that the vacuum method and the specific gravity method give almost identical results, and both more than one-fifth higher than by absorption in free atmosphere. Hence we concluded that our doubts as to the accuracy of method No. 1 were well founded, and that if we wished to obtain accurate information regarding porosity of tile we must use either method No. 11 or No. 111. As the second is the simpler both in manipulation and calculation it was used exclusively in subsequent work.

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It might be urged that method No. 1, while not giving the absolute pore space, would give comparative results, for the amount of air not expelled from the tile would be the same in different kinds of tile. That does not necessarily follow. We should expect that the finer the pores the more air would be imprisoned, the coarser the pores, the less air imprisoned.

Ten other Port Dover clay tile were then taken, and their porosity determined, two samples from each tile, the average of the twenty determinations showing a porosity of 35.66 per cent., a result almost identical with that already reached for the three tile. I must confess that it was a surprise to me to learn that the walls of these Port Dover tile were more than one-third air. They were not what one would term "soft" burned, neither were they hard burned—just medium. All the above tile were 4 inches in diameter.

Three inch tile of the same make showed a porosity of 31.7 per cent.

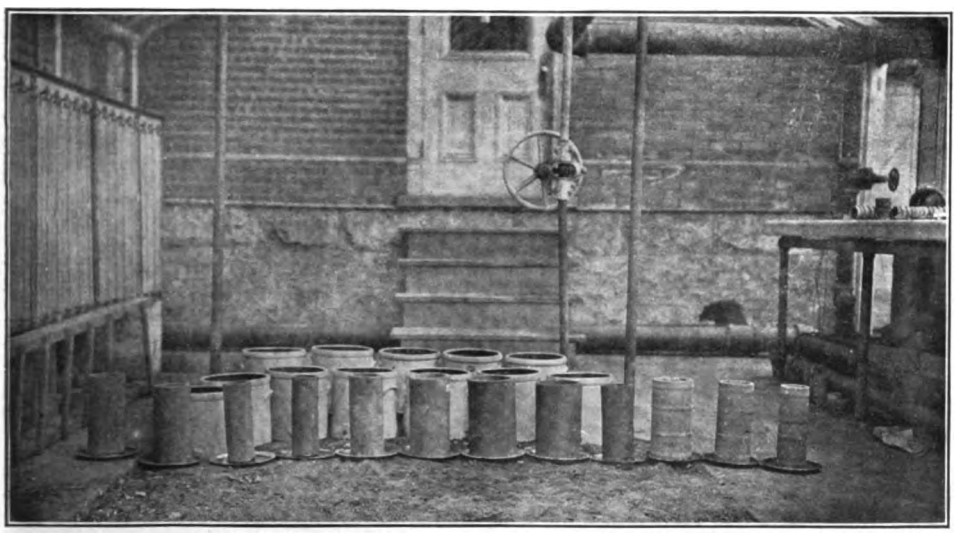

Fig. 7.—Tile set in plates of hot pitch. When the pitch hardens the lower ends of tile are sealed watertight. Crocks of water in the background.

We happened to have in our laboratory at the time, for testing purposes, some four inch clay tile made at Kingsville. These were just ¾ as thick as the Port Dover tile of the same diameter, and were burned considerably harder. Their average porosity proved to be 23.8 per cent. as compared with 35.7 for Port Dover. So we see that "porosity of clay tile" has a variable meaning, and the range of variation is considerable. Whether the great difference in porosity just noted resulted from a difference in burning solely, or from difference in clay, or difference in wetness of the clay, or difference in machinery, or difference in thickness, or from some combination of these factors we were unable to determine. Undoubtedly burning had much to do with the difference in porosity, and possibly difference in thickness influenced the burning.

Some four inch cement tile made at Woodstock, on a large power machine, and said to be mixed in the proportion of 1 to 4, proved to have a porosity of 22.5 per cent. 5 inch tile of the same manufacture had a porosity of 16.3 per cent., i e., the larger tile had the smaller porosity, while three inch tile made on the same machine had the same porosity as the four inch, viz., 22.5 per cent.

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Some 3 inch cement tile made at Marden on another power machine had a porosity of 27.7 per cent.

With hand made cement tile, proportion 1 to 4 made on the Farmers' Cement Tile Machine the case was just the opposite, the three inch having a porosity of 22.0 per cent., the four inch of 27.8 per cent.

A very interesting study in percolation grew out of the study of porosity, by which we were able to answer the question whether tile let the water into the drains through the pores or through the joints. Several tile of the various sizes and different makes were set in plates of boiling pitch, and the pitch allowed to cool. This sealed the bottom ends of the tile air-tight and water-tight. Fig. 7 shows the tile thus prepared. They were next set in water, (see Fig. 8) which stood near the top of the tile. In this position they were left for a week to see how much water would percolate through the walls. At the end of one

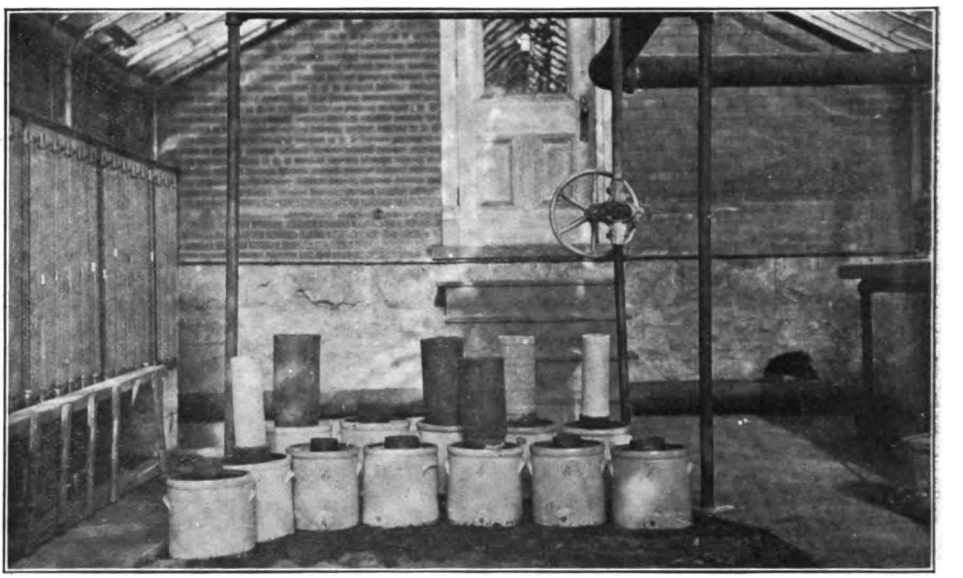

Fig. 8.—Tile sealed on bottom are set in crocks of water. The greatest depth of water in any clay tile at end of one week was 3¼ inches. Cement tile varied, some full, some with practically no water in them.

week not a clay tile of any of the different makes was full of water. The most in any clay tile was 3½ inches. At this rate it would have taken 20 days for that tile to fill with water up to the same level as the water outside. The next clay tile would have taken 23 days to fill, the others, 175 days, 233 days and 234 days respectively. From this we must conclude that practically no water enters clay tile drains through the pores, it all enters through the joints.

With the cement tile we found considerable difference of behaviour, even with the tile made on the same machine, and of the same materials in the same proportion. Some of the hand-made cement tile shut out the water just as completely as the tightest clay tile, while others filled with water in a short time. The same is true of the power made cement tile. On examining the specimens that behaved in different ways, we found that the difference arose from a difference in the wetness of the mortar. If it was wet enough that the packer produced a

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smooth watery surface on the entire inner surface, that tile wall would be practically water-tight, but if there was not sufficient moisture for this, then the tile wall would let water through readily, and the tile would fill in a short time.

TABLE III.—POROSITY OF TILE OF VARIOUS MAKES AND SIZES.

Make	3"	4"	5"
Port Dover (clay)	31.7	35.7	.....
Kingsville (clay)	.....	23.8	.....
Woodstock (power cement)	22.5	22.5	16.3
Marden (power cement)	27.7	.....	.....
Hand made (Walkerville cement machine)	22.0	27.8	.....
Hand made (Sure Shut cement machine)	.....	30.6	.....

Now, the clay tile that let water through its pores fastest was a Kingsville 4 inch tile which had a porosity of 23.8 per cent. It let through 3½ inches in a week, while Port Dover with a porosity 50 per cent. greater let through only a few drops. Consequently it is not porosity altogether that controls percolation through walls of tile. On examination the Kingsville tile were found not quite so glossy either inside or outside as the Port Dover, showing that the Kingsville tile had been made drier than the others. The glossier the finish the more water-tight the tile. The same holds true of the cement tile, as previously pointed out. And this explains why the impression has gone abroad that cement tile are much more porous than the clay tile. Hand-made cement tile are seldom glossy on the inside, and so water will run through the wall readily. The same is sometimes true of power made cement tile. And before cement tile makers learned that strength of wall is a large factor in good tile they used to demonstrate how readily water would percolate through the wall of their tile. This was in the days when cement tile makers taught that a mixture of 1 to 6 would, even in hand machines, make good cement tile. But as they began to learn that cement tile were being rejected on account of weakness they used stronger mixtures and also wetter, and the percolation through the walls became a thing of the past. For instance, the 4 inch, 5 inch, and 6 inch Woodstock cement tile in the percolation test only let a few drops of water through them in a whole week.

Porosity of tile wall, however, is not a factor in drainage, as we may easily see. Practical men know that in laying tile the average width of joint in well laid tile is about one-sixteenth of an inch. If that is correct then twelve of those joints would have the same area as the end of the tile, or if the joints were one thirty-second of an inch wide it would require twenty-four to give the same area as the end. Hence twelve or twenty-four joints, depending on the width, should let through about enough water to make the tile flow full, or perhaps allowing for greater friction in passing through the joints it would require twice those numbers. But we know from actual experience that we can lay from 700 to 1,000 three inch tile in a row before enough water gets in them to fill the tile. Seven hundred joints one-sixteenth of an inch wide would let through enough water to fill the tile many times over; hence it is not the capacity of the tile to admit water that determines the speed of drainage, but it is the rate at which the water can get through the soil to the tile. Hence porosity of tile is important only in so far as it is a criterion of the strength of tile.

This is well brought out in the two kinds of hand made cement tile. The Walkerville packs its tile better than the Sure Shut, as shown by the porosity

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of 27.8 compared with 30.6. The average strength of the Walkerville 4 inch tile was 837 pounds, that of the Sure Shut only 459 pounds. The Sure Shut was a little thinner, about 15 per cent., so that lack of packing was mostly responsible for the weakness of the Sure Shut tile. Both kinds were made by the same man, of the same materials, and each made as wet as the respective machines would handle the mixture.

We should hesitate to lay tile made on the Sure Shut machine.

Educational Exhibits.

At the Toronto Exhibition and the Guelph Winter Fair the usual departmental exhibit was set up, with a man in charge during the entire shows. These exhibits require considerable time and thought. The subjects illustrated this year were: Cold storage, lightning protection, drainage, sewage, soil physics.

Summer Classes.

Besides the instruction given to the regular classes, as mentioned at the outset, the department gave the time allotted in the time-tables to lectures with the various short courses, e.g., Cold Storage and Drainage with Stock and Seed Judging Class. Cold Storage, Soil Physics, Drainage with the Fruit Course, and several lectures and laboratory periods per week with the Normal Students, Public School Teachers' Short Course, and High School Science Teachers' Course.

Weather Report.

Tables IV, V and VI give the weather data at representative stations which this department has equipped with the necessary meteorological apparatus.

TABLE IV.— Weather Report for 1913.

Month.	Mean temperature.	Departure from normal.	Highest temperature.	Lowest temperature.	Snowfall in inches.	Rainfall in inches.	Precipitation in inches.	Departure from normal.
O.A.C., Guelph—		(26 yrs)						(26 yrs)
January	26.8	+ 7.4	45.0	4.0	9.9	2.37	3.36	+ 1.34
February	17.0	— 1.8	44.0	— 5.0	13.0	.08	1.38	— .26
March	30.6	+ 3.2	66.0	— 2.0	11.0	.65	1.75	+ .42
April	43.9	+ 2.6	73.0	25.0	.....	3.53	3.53	+ 1.76
May	52.5	— .8	81.0	27.0	.....	1.37	1.37	— 1.11
June	63.4	— .1	90.0	34.0	.....	2.03	2.03	— .61
July	67.6	— .4	91.0	43.0	.....	3.26	3.26	+ .32
August	67.0	+ 1.1	95.0	38.0	.....	2.88	2.88	+ .51
September	57.4	— 1.5	88.0	29.0	.....	1.49	1.49	— .77
October	49.6	+ 2.5	81.0	23.0	.5	2.59	2.64	+ .31
November	39.3	+ 4.8	65.0	23.0	1.0	3.29	3.39	+ 1.11
December	29.9	+ 4.8	48.0	— 2.0	4.5	.13	.58	— 1.10
Year	45.4	+ 1.8	95.0	— 5.0	39.9	23.67	27.66	+ 1.92

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TABLE IV.—WEATHER REPORT FOR 1913.—Continued.

Month.	Mean temperature.	Departure from normal.	Highest temperature.	Lowest temperature.	Snowfall in inches.	Rainfall in inches.	Precipitation in inches.	Departure from normal.
Cairo—		(2 yrs)						(2 yrs)
January	28.6	+ 8.9	50.0	2.0	.....	3.58	3.58	+1.14
February	21.4	+ 2.4	49.0	— 2.0	.....	.30	.30	+ .10
March	32.3	+ 3.9	67.0	—10.0	.....	4.03	4.03	+2.03
April	44.4	+ .3	79.0	21.0	.....	2.94	2.94	—1.89
May	52.1	+ 4.2	83.0	23.0	.....	3.04	3.04	— .03
June	66.6	+ 2.2	94.0	32.0	.....	2.26	2.26	— .06
July	68.9	+ 2.7	94.0	43.0	.....	4.57	4.57	+ .89
August	69.8	+ 1.8	94.0	41.0	.....	5.30	5.30	—1.43
September	59.4	— 2.5	91.0	32.0	.....	0.00	0.00	—1.34
October	51.6	+ .3	83.0	31.0	.....	3.73	3.73	+ .83
November	41.1	+ 1.4	68.0	24.0	.....	1.56	1.56	— .41
December	31.5	+ 1.1	55.0	10.0	.....	0.00	0.00	— .45
Year	47.3	+ 1.7	94.0	—10.0	.....	31.31	31.31	— .62
Camlachie—		(1 year)						(1 year)
January	25.1	.....	50.0	— 4.0	1.80	5.50	5.68	.....
February	20.9	.....	54.0	— 4.0	.....	.30	.30	.....
March	30.5	.....	66.0	— 9.0	.80	.55	.63	.....
April	42.8	.....	81.0	15.0	.....	3.07	3.07	.....
May	50.0	.....	81.0	25.0	.....	1.89	1.89	.....
June	65.2	.....	94.0	31.0	.....	.....	.....	.....
July	68.9	.....	95.0	39.0	.....	3.45	3.45	.....
August	68.6	.....	93.0	40.0	.....	.54	.54	.....
September	59.5	.....	92.0	30.0	.....	.....	.....	.....
October	48.6	.....	83.0	29.0	.....	5.19	5.19	.....
November	42.1	.....	66.0	17.0	.....	2.73	2.73	.....
December	31.8	.....	55.0	10.0	.....	0.00	0.00	.....
Year	46.2	.....	95.0	— 9.0	2.60	23.22	23.48	.....
Charlottetown —		(7 yrs)						(7 yrs)
January	23.0	+4.9	50.0	— 3.0	16.2	4.56	6.18	+2.37
February	13.2	—3.1	46.0	—17.5	21.5	.34	2.49	+ .08
March	30.4	+4.2	60.0	— 4.0	5.4	4.99	5.53	+2.64
April	39.5	+3.6	75.0	17.5	5.0	3.09	3.59	+ .46
May	44.5	—1.7	68.7	28.5	1.0	1.88	1.98	— .46
June	54.1	—2.1	73.0	34.0	.....	1.34	1.34	— .99
July	63.8	— .9	83.5	44.0	.....	4.01	4.01	+ .17
August	64.5	+1.3	82.5	43.0	.....	2.89	2.89	—1.36
September	57.4	+1.1	75.0	39.0	.....	3.52	3.52	— .17
October	55.0	+7.3	70.0	33.0	.....	5.44	5.44	+1.78
November	37.9	+ .7	62.0	18.0	4.2	1.40	1.82	—1.93
December	27.1	+1.1	56.0	7.0	16.5	2.20	3.85	—1.09
Year	42.5	+1.3	83.0	—17.5	69.8	35.66	42.64	+1.50

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TABLE IV.—WEATHER REPORT FOR 1913.—Continued.

Month.	Mean temperature.	Departure from normal.	Highest temperature.	Lowest Temperature.	Snowfall in inches.	Rainfall in inches.	Precipitation in inches.	Departure from normal.
Lakeside Farms, Forest		(2 years)						(2 years)
January	28.5	+8.8	51.0	5.0	.....	3.84	3.84	+1.74
February	20.4	+1.6	52.0	3.0	.....	.89	.89	+ .44
March	42.1	+9.4	66.0	—3.0	.....	2.24	2.24	+1.01
April	43.6	+ .6	80.0	20.0	.....	2.74	2.74	+ .28
May	53.0	+ .2	83.0	29.0	.....	2.12	2.12	—1.50
June	64.5	+1.5	90.0	36.0	.....	2.35	2.35	+ .51
July	63.6	+ .2	93.0	42.0	.....	2.43	2.43	— .65
August	68.3	+2.1	90.0	42.0	.....	5.15	5.15	+1.13
September	59.8	—1.8	92.0	38.0	.....	.29	.29	—2.16
October	51.8	+ .6	83.0	31.0	.....	5.07	5.07	+1.66
November	41.4	+ .8	66.0	22.0	.....	2.64	2.64	0.00
December	32.8	+1.2	52.0	13.0	.....	.43	.43	— .27
Year	47.9	+2.1	93.0	—3.0	.....	30.19	30.19	+2.19
Leamington—		(7 years)						(7 years)
January	28.5	+5.1	46.0	7.0	5.50	5.76	6.31	+3.27
February	22.3	0.0	50.0	— 5.0	6.75	.65	1.32	+ .33
March	31.6	—2.4	62.0	3.0	5.50	6.35	6.90	+4.50
April	43.2	— .8	80.0	23.0	.....	2.07	2.07	0.00
May	56.2	+ .8	84.0	26.0	.....	3.65	3.65	+1.45
June	68.1	+2.3	97.0	34.0	.....	.74	.74	—1.86
July	73.3	+1.2	97.7	47.0	.....	2.06	2.06	— .05
August	71.9	+2.2	97.5	49.0	.....	1.50	1.50	—1.02
September	63.7	+1.3	96.0	36.0	.....	.53	.53	—1.93
October	52.1	+1.7	81.0	29.0	.....	4.41	4.41	+1.69
November	41.0	+3.0	62.0	20.0	2.00	1.40	1.60	— .94
December	32.7	+3.4	55.0	17.0	.50	.83	.88	— .70
Year	48.7	+1.4	97.7	— 5.0	20.25	29.95	31.97	+4.74
Magnetawan—		(8 years)						(8 years)
January	16.5	+3.4	46.0	—24.5	30.70	.82	3.89	+ .57
February	8.9	—1.7	39.0	—33.5	46.60	.74	5.40	+2.45
March	23.6	+2.5	56.0	—23.5	10.90	2.37	3.46	+ .94
April	40.4	+3.6	79.5	18.5	2.00	3.89	4.09	+1.25
May	49.6	+ .4	79.5	23.5	.....	2.40	2.40	— .73
June	58.6	— .7	87.0	29.0	.....	1.76	1.76	— .47
July	64.0	— .6	87.0	36.0	.....	1.74	1.74	— .10
August	61.5	— .5	91.5	30.0	.....	5.04	5.04	+1.05
September	54.7	—1.0	88.0	24.0	.....	3.15	3.15	+ .13
October	46.9	+3.1	79.0	15.5	.....	3.99	3.99	+ .24
November	35.2	+4.2	59.0	15.0	4.00	4.31	4.71	+1.22
December	25.8	+7.7	46.0	—10.5	.79	.79	.86	—1.49
Year	40.5	+1.7	91.5	—33.5	94.99	31.00	40.49	+5.06

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TABLE IV.—WEATHER REPORT FOR 1913.—Continued.

Month.	Mean temperature.	Departure from normal.	Highest temperature.	Lowest temperature.	Snowfall in inches.	Rainfall in inches.	Precipitation in inches.	Departure from normal.
Maitland—		(8 years)						(8 years)
January	27.0	+7.7	49.0	— 6.0	5.50	3.15	3.70	+1.50
February	10.8	—1.8	40.0	—11.0	2.00	.....	.20	—1.31
March	29.2	+4.6	66.0	— 8.0	3.50	3.59	3.94	+2.23
April	43.3	+3.1	82.0	23.0	.....	2.61	2.61	+ .58
May	51.1	—1.3	82.0	30.0	.....	3.31	3.31	+ .21
June	60.9	+ .5	85.0	35.0	.....	.62	.62	—1.50
July	69.1	+ .9	93.0	48.0	.....	2.55	2.55	+ .28
August	65.7	— .3	91.0	42.0	.....	1.57	1.57	— .31
September	59.5	— .8	85.0	32.0	.....	1.44	1.44	—1.26
October	51.4	+2.1	80.0	23.0	.....	5.80	5.80	+3.36
November	39.4	+3.3	63.0	20.0	.90	2.32	2.41	+ .35
December	30.6	+7.8	44.0	— 6.0	6.40	.25	.89	—1.05
Year	44.8	+2.1	93.0	—11.0	18.30	27.21	29.04	+3.08
Monteith—		(3 years)						(3 years)
January	9.6	+5.6	43.0	—31.0	7.50	.04	.79	— .61
February	— 1.7	—5.8	26.0	—40.0	17.50	.....	1.75	+ .14
March	13.8	+ .7	52.0	—30.0	25.50	.....	2.55	+1.33
April	32.1	+2.1	79.0	0.0	9.00	.....	.90	— .24
May	42.6	—5.3	83.0	18.0	.50	2.30	2.35	— .40
June	59.3	+ .5	83.0	22.5	.....	1.58	1.58	—1.42
July	58.7	—3.9	96.0	28.0	.....	4.38	4.38	+ .82
August	55.3	—3.0	85.0	13.0	.....	2.75	2.75	— .01
September	48.7	— .9	85.0	18.0	.....	2.76	2.76	— .26
October	39.5	0.0	75.0	10.0	8.00	1.01	1.81	+ .07
November	29.6	+ 5.0	60.0	8.0	9.00	1.29	2.19	+ .17
December	19.5	+ 2.6	38.0	— 1.0	8.55	.50	1.35	—1.21
Year	33.9	0.0	96.0	—40.0	85.55	16.61	25.16	—1.62
Port Lambton, River St. Clair—		(1 year)						(1 year)
January	27.4	.....	49.0	4.0	3.50	3.81	4.16	.....
February	20.8	.....	47.0	— 2.0	4.25	.76	1.18	.....
March	31.7	.....	65.0	— 9.0	3.25	3.46	3.78	.....
April	44.2	.....	77.0	20.0	.....	3.50	3.50	.....
May	53.1	.....	82.0	28.0	.....	3.38	3.38	.....
June	61.6	.....	90.0	31.0	.....	1.33	1.33	.....
July	68.1	.....	99.0	41.0	.....	2.83	2.83	.....
August	66.9	.....	92.0	39.0	.....	3.40	3.40	.....
September	59.4	.....	91.0	30.0	.....	.56	.56	.....
October	51.3	.....	78.0	29.0	.....	4.13	4.13	.....
November	42.6	.....	67.0	18.0	2.00	1.62	1.82	.....
December	33.5	.....	56.0	12.0	1.50	.12	.27	.....
Year	46.7	.....	99.0	— 9.0	14.50	28.90	30.34	.....

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TABLE IV.—WEATHER REPORT FOR 1913.—Continued.

Month.	Mean temperature.	Departure from normal.	Highest temperature.	Lowest temperature.	Snowfall in inches.	Rainfall in inches.	Precipitation in inches.	Departure from normal.
Powles' Corners—		(6 years)						(6 years)
January	23.8	+6.0	49.0	—16.0	.....	.40	.40	— .69
February	11.8	—4.2	33.0	—18.0	.30	.....	.03	—1.06
March	23.8	—1.7	56.0	—13.0	.92	.....	.09	— .26
April	50.0	+ 8.8	82.0	21.0	.....	1.25	1.25	— .89
May	51.9	—1.9	84.0	26.0	.....	2.06	2.06	—1.40
June	66.4	+2.7	91.0	36.0	.....	2.70	2.70	+1.28
July	67.3	—1.4	93.0	44.0	.....	3.31	3.31	— .92
August	66.3	+1.0	94.0	44.0	.....	4.22	4.22	+1.09
September	51.2	—6.4	86.0	31.5	.....	3.68	3.68	+ .94
October	49.0	+3.3	79.0	20.0	.....	1.56	1.56	—1.17
November	38.1	+4.2	68.0	20.0	.01	3.87	3.87	+1.28
December	24.2	+1.6	48.0	— 7.0	4.50	.....	.45	— .50
Year	43.7	+1.0	94.0	—18.0	5.73	23.05	23.62	—2.32
Richard's Landing—		(8 years)						(8 years)
January	19.8	+3.9	46.0	—10.0	9.00	.....	.90	— .88
February	5.1	—9.7	33.0	—29.0	13.00	.....	1.30	— .52
March	20.3	—2.2	52.0	—23.0	10.00	5.10	6.10	+3.69
April	31.8	—4.5	72.0	20.0	.....	1.87	1.87	— .43
May	47.0	—2.6	82.0	28.0	.....	2.64	2.64	—1.11
June	60.9	+ .2	85.0	32.0	.....	3.72	3.72	+1.16
July	62.4	—2.2	85.0	42.0	.....	3.24	3.24	+ .41
August	64.3	+1.4	88.0	39.0	.....	5.32	5.32	+1.53
September	55.0	—2.9	91.0	30.0	.....	3.14	3.14	— .68
October	47.4	+2.0	75.0	20.0	.....	5.36	5.36	+2.17
November	35.6	+2.5	55.0	15.0	4.65	2.50	2.96	+ .46
December	27.8	+5.8	47.0	5.0	3.50	.....	.35	—3.03
Year	39.8	— .7	91.0	—29.0	40.15	32.89	36.90	+2.77
Vineland Station—		(5 years)						(5 years)
January	32.5	+6.8	55.5	11.0	.32	3.83	3.86	+1.70
February	21.8	—2.0	50.0	3.0	1.04	.20	.30	— .30
March	34.8	+2.9	71.0	1.0	2.39	2.93	3.16	+2.00
April	44.7	+1.8	74.0	28.0	2.00	3.18	3.38	+ .81
May	54.3	+1.7	85.5	34.5	.....	1.35	1.35	—1.20
June	64.1	+1.0	93.0	39.5	.....	3.04	3.04	+ .95
July	69.9	+ .6	93.0	49.5	.....	1.07	1.07	—1.82
August	67.8	+3.2	93.0	50.5	.....	4.92	4.92	+1.18
September	59.0	—1.9	89.5	37.0	.....	1.56	1.56	— .89
October	52.4	+3.5	80.5	30.0	.....	2.74	2.74	+ .14
November	43.6	+3.5	69.0	23.0	.11	3.84	3.85	+1.60
December	34.8	+4.0	54.0	9.0	1.40	.57	.71	— .41
Year	48.3	+1.9	93.0	1.0	7.25	29.23	29.94	+3.76

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TABLE IV.—WEATHER REPORT FOR 1913.—Continued.

Month.	Mean temperature.	Departure from normal.	Highest temperature.	Lowest temperature.	Snowfall in inches.	Rainfall in inches.	Precipitation in inches.	Departure from normal.
Walkerton—		(4 years)						(4 years)
January	18.0	0.0	.....	.....	3.00	0.00	.30	— .01
February	18.9	0.0	.....	.....	.....	0.04	.04	— .01
March	33.8	+5.0	60.0	9.0	.....	0.00	0.00	— .64
April	43.8	+ .5	80.0	21.0	.....	5.24	5.24	+2.65
May	52.2	—4.1	82.0	25.0	.....	2.09	2.09	—1.59
June	60.1	—1.7	91.0	13.0	.....	2.45	2.45	+ .35
July	65.6	—1.6	92.0	30.0	.....	3.56	3.56	+ .91
August	67.8	+3.1	95.0	36.0	.....	3.63	3.63	—1.63
September	58.3	+ .8	92.0	29.0	.....	2.96	2.96	— .99
October	48.9	+ .6	83.0	25.0	.....	5.27	5.27	+ .82
November	41.8	+8.6	69.0	23.0	.....	3.94	3.94	+ .57
December	30.5	+4.3	51.0	12.0	.....	0.00	0.00	— .75
Year	44.9	+1.3	95.0	9.0	.....	29.18	29.48	— .32
Wyoming—		(2 years)						(2 years)
January	27.6	+9.2	49.0	3.0	.....	4.22	4.22	+2.11
February	19.8	+2.6	53.0	— 2.0	.....	.50	.50	+ .25
March	31.4	+4.4	67.0	7.0	.....	3.70	3.70	+1.85
April	44.9	+ .8	80.0	16.0	.....	2.75	2.75	— .01
May	53.6	— .8	84.0	27.0	.....	3.80	3.80	— .93
June	63.9	+1.1	92.0	33.0	.....	2.91	2.91	+ .63
July	68.9	+3.6	91.0	40.0	.....	3.90	3.90	— .34
August	67.4	+3.2	93.0	40.0	.....	6.13	6.13	+ .28
September	58.4	—1.7	93.0	31.0	.....	.32	.32	—2.66
October	50.6	+ .5	82.0	25.0	.....	4.45	4.45	+ .86
November	40.9	+ .3	68.0	16.0	.....	2.28	2.28	— .35
December	32.4	+ .8	54.0	11.0	.....	0.00	0.00	— .59
Year	46.7	+2.0	93.0	— 2.0	.....	34.96	34.96	+1.10

TABLE V.—LENGTH OF SEASONS AT VARIOUS STATIONS, 1913.

Stations.	Last killing frost in spring.		First killing frost in autumn.		No. of days between first and last frosts.	Average length of season free from killing frosts.
	Date.	Degree.	Date.	Degree.		
Guelph	May 11...	29.0	Sep. 14...	29.0	126	147 (26 years)
Cairo	May 13...	27.0	Nov. 1...	26.0	172	171 (2 years)
Camlachie	May 12...	29.0	Sep. 10...	30.0	121	121 (1 year)
Charlottetown	May 17...	29.5	Nov. 1...	25.0	168	155 (7 year)
Lakeside Farms, Forest.	May 28...	29.0	Nov. 1...	29.0	157	173 (2 year)
Leamington	May 11...	29.0	Oct. 31...	29.0	173	160 (7 year)
Magnetawan	June 9...	29.5	Aug. 25...	30.0	77	119 (8 years)
Maitland	May 11...	30.0	Oct. 14..	30.0	156	148 (8 years)
Monteith	Killing frost in every month				.....	24 (3 years)
Port Lambton	May 12...	30.0	Sept. 14..	30.0	125	125 (1 year)
Powles' Corners	May 11...	29.0	Oct. 22...	22.0	164	159 (6 years)
Richards Landing	May 26...	30.0	Sept. 14..	30.0	111	131 (8 years)
Vineland Station	Apr. 21...	28.5	Oct. 31...	30.0	193	180 (5 years)
Walkerton	July 12...	30.0	Sept. 14..	29.0	64	133 (4 years)
Wyoming	May 11...	27.0	Oct. 31...	25.0	173	172 (2 years)

30° taken as killing frost.

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TABLE VI.—WIND RECORD AT GUELPH, 1913.

Month.	Miles of wind.	No. of days on which records were kept.	Average miles of wind per day.	Average miles of wind per hour.	Windiest day.				Calmest day.			
					Total miles.	Miles per hour	Miles on windiest hour.	Least windy hour.	Total miles.	Miles per hour	Windiest hour.	Calmest hour.
January *1....	3,712	10.0	371,200	15.5	590	24.6	32	15	205	8.5	20	3
February.....	9,012	25.8	340,930	14.5	621	25.1	41	13	84	3.5	7	1
March *2.....	6,020	19.1	315,236	13.2	504	21.0	28	11	115	4.8	10	2
April.....	8,407	27.1	310,221	12.9	553	23.0	30	14	134	5.6	10	2
May.....	7,820	31.0	252,258	10.5	461	19.2	27	9	115	4.8	8	2
June	6,135	30.0	204,500	8.5	329	13.7	21	3	102	4.3	11	3
July.....	6,989	30.3	230,660	9.6	478	19.9	31	10	119	5.0	8	1
August.....	5,803	26.7	217,341	9.1	374	15.6	25	8	102	4.2	11	0
September....	6,820	30.0	294,000	9.5	369	15.4	21	3	129	5.4	10	2
October.....	4,821	22.8	211,442	8.8	397	16.5	25	7	90	3.8	8	1
November	9,140	28.9	316,263	13.2	485	20.2	30	11	81	3.4	6	1
December	9,000	31.0	290,323	12.1	453	18.9	24	15	114	4.8	9	2

*1 Machine out of repair until January 22nd, 1913.
*2 Machine blown down during high wind on Good Friday, March 21st.

CORRESPONDENCE.

The correspondence of the department is about the same as last year—approximately 4,500 letters, together with post cards, bills, lecture notes, directions for practical work, bulletins, weather records, etc.

All of which is respectfully submitted.

WM. H. DAY.

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PART VII.

THE PROFESSOR OF DAIRY HUSBANDRY.

To the President of the Ontario Agricultural College:

SIR,—I have the honor to present my twenty-third annual report of the Dairy Department of the College.

During the year Mr. Rickwood resigned his position as Demonstrator in Milk-Testing and Buttermaking, to operate a creamery of his own in Western Ontario. His place was filled by the appointment of R. W. Brown, B.S.A., a Graduate in Dairying, 1913. Mr. Fred Overland, a Short Course student, was in charge of the Butter Branch between the time of Mr. Rickwood's leaving and the appointment of Mr. Brown.

The following are applicants for Cheese and Buttler Diplomas for the year 1913:

Name.	*Address.*	*Diploma.*
Baxter, Chas.	Orono, Ont.	Buttermaking
Cotton, Henry	Bright, Ont.	Cheesemaking
Glass, F. M.	Emerald, Ont.	Cheesemaking
Hammond, Harold	Walsh, Ont.	Cheesemaking
Hammond, J. L.	Embro, Ont.	Cheesemaking
Hill, Jas. A.	Jarvis, Ont.	Buttermaking
McKinney, T. J.	Bervie, Ont.	Buttermaking
Morrison, C. A.	Whitechurch, Ont.	Buttermaking
Morse, Wm.	Trowbridge, Ont.	Cheesemaking
Rogers, Harry	River Hebert, N.S.	Buttermaking
Skelton, R. J.	Markdale, Ont.	Buttermaking
Stephenson, F. W.	Brussels, Ont.	Buttermaking

As in former years we have supervised the official testing for the Canadian Holstein Record of Merit. The number of tests supervised by us in 1912 was 384 seven day tests, 30 fourteen day tests, and 75 thirty day tests. In 1913, the numbers were 427 seven day tests, 59 fourteen day tests, 4 twenty-one day tests, and 29 thirty day tests.

Two new short courses in dairy work were given at the close of the regular three months' term in the latter part of March and the early part of April—one for Cow-Testing, and one in Ice Cream Manufacture. The total registration in all the dairy short courses was 103.

BUTTERMAKING.

COMPARISON OF YIELD IN SALT AND SALTLESS BUTTER.

The question came up at the Creamery Convention held at the Dairy of the College in December, 1912, as to whether there was more or less butter obtained by making saltless, as compared with making salt butter.

Six tests were made in a Simplex churn, where the churnings averaged 80 to 100 lbs. butter each. All conditions were as nearly alike as possible. Salt was added to the salt lots at the rate of 5 per cent. based on the fat content of the cream. The saltless butter had salt added after weighing, in order to prepare it for market, and the yield was similar to the salted lots.

The results were:

	Salt Butter.	Saltless Butter.
Average lbs. finished butter per churning.....	103.37	99.66
Average percentages of moisture in	14.83	14.78

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Comments.

The average increased yield of the salt butter as compared with the saltless was about 3.5 per cent. This means that the "overrun" would be less by making saltless butter, and such butter would have to be sold for a higher price in order to be as profitable as the making of salt butter.

There was not much difference in the moisture content of the salt and saltless butters in these tests, hence the increased yield of butter must have come nearly altogether from the salt added.

Effect of Working Butter in a Combined Churn with Tap Open and with Tap Closed During the Working Process.

It has been claimed by some buttermakers that if the drainage tap in a combined churn and worker were kept closed during the time of working the butter, that more of the moisture and salt would be retained in the finished butter, thus increasing the "overrun," and consequently the yield of butter.

Eight tests were made having the tap open, and an equal number with the tap closed. The results were:—

	Tap Open.	Tap Closed.
Average percentage of moisture in the finished butter	14.31	14.55
Average percentage salt in finished butter	2.81	2.98
Average score of the butter for flavor (50)	41.75	42.30
" " " " " grain (20)	18.40	18.55
" " " " " color (15)	14.90	14.80
" " " " " salt (10)	9.80	9.90
" " " " " package (5)	5.00	5.00
Total (100)	89.85	91.05

Comments.

According to these tests the average percentage of moisture in the finished butter was increased about one-quarter of one per cent., the salt was increased nearly two-tenths of a per cent., and the butter scored over one point higher by keeping the churn tap closed during working of the butter. However, we should not advise this method until further tests have been made.

Moisture in Butter when Fresh, and at the End of One, Two, and Three Months.

These tests are a continuation of those made in 1912. Five experiments were made. Samples for moisture determination were taken immediately before printing and after printing. Three prints of butter from each test were placed in an ice cold-storage at a temperature of about 40°F. One print was tested for moisture at the end of one month, another at the end of two months, and a third at the end of three months. The moisture in all cases was determined by weighing ten grams of butter into a beaker, which was then heated over an alcohol flame until the water was evaporated.

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The results were:

Date of Making the Butter.	Average Moisture				
	Before Printing %	After printing %	One month %	Two months %	Three months %
April 22	14.6	14.5	13.8	13.0	12.9
May 20	14.4	14,2	13.6	13.5	12.6
June 3	15.5	15.3	14.8	14.2	13.7
June 10	15.2	15.0	14.4	13.8	13.0
June 18	15.6	15.4	14.7	13.8	13.2
Average of all tests	15.06	14.88	14.26	13.66	13.08

Comments.

The results agree with those obtained last year and indicate a decrease in the moisture content of butter from the time of printing up to the end of three months held in cold-storage. The average of the foregoing shows a decrease of nearly 2 per cent. moisture in the prints held for three months in an ice cold-storage as compared with the butter from which they were made. Three months is an unusual length of time to hold prints, but the decrease at the end of one month was about three-quarters of one per cent.

Comparison of a Canadian and an English Brand of Salt for Butter-making.

In our report for 1911 we gave a brief account of a test comparing a Canadian and an English brand of salt for buttermaking in which we did not find much difference in the results. However, the English firm was not satisfied with these tests. They said the salt sent us by their Canadian representative had been in stock for some time, and that if we would repeat the tests with fresher material we should find a difference. Accordingly we made eleven tests during the summer of 1913. In each test a given weight of cream was divided into two lots and churned separately. Each churning of cream produced about 80 to 100 lbs. of butter. Both lots were treated as nearly alike as possible up to the time of salting. The amount of salt added was five per cent. based on the fat content of the cream, that is, for 100 lbs. of cream-fat five lbs. of salt were added in both cases.

The results were:—

	Canadian Salt.	English Salt.
Average percentage of moisture in the butter	14.80	14.84
Average percentage salt contained in the butter	3.05	3.13
Average score for flavor (50)	42.37	42.30
" " " grain (20)	18.62	18.52
" " " color (15)	14.68	14.69
" " " salt (10)	9.93	9.96
" " " package (5)	5.00	5.00
Total score (100)	90.60	90.47

Again we have to report that there was not much difference in the results obtained by using these two brands of salt.

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CHEDDAR CHEESE EXPERIMENTS.

(Mr. McKay.)

Vat Tests of Casein and Fat, 1913, O.A.C.

This is the sixth year for these tests, showing the range in percentages of casein and fat as delivered to us in the milk furnished by patrons living near the College. There was a slight change in the patrons during this season, as two, whose milk tested comparatively high in former years, dropped out, thus making the tests somewhat lower, and the lbs. of milk required to make a pound of cheese higher than usual.

A brief report on the milk received, cheese made, and the pounds of milk required to make a pound of cheese, by months, follows, together with a table showing the range in casein and fat for the season. During the past six years the average percentages of casein and fat in the milk delivered to us have been:—

—	1908	1909	1910	1911	1912	1913
Casein.....	2.39	2.50	2.46	2.30	2.17	2.08
Fat	3.67	3.60	3.60	3.58	3.56	3.35

These results show a downward tendency in the average percentages of casein and fat in the milk delivered to us, in spite of the fact that milk is paid for by "test."

Milk Used and Cheese Made, Season 1913.

Month.	Lbs. Milk.	Lbs. cheese made.	Average lbs. milk required to make 1 lb. cheese.
April	6,529	591.89	11.03
May.....	14,964	1,327.91	11.26
June	26,939	2,415.55	11.10
July.....	12,895	1,106.65	11.65
August	17,064	1,508.17	11.35
September.....	12,260	1,179.08	10.39
October	6,721	690.57	9.73

Vat Tests for Casein and Fat, Season 1913.

Month	No. of tests.	Per cent. casein in milk.		Per cent. fat in milk.		Per cent. fat in whey.	Average lbs. milk per lb. cheese.	Average lbs. cheese per lb.	
		Range.	Average.	Range.	Average.			Fat.	Casein.
April.....	9	2.0 to 2.2	2.0	3.2 to 3.6	3.3	.19	11.03	2.6	4.25
May	17	2.0 to 2.2	2.0	3.1 to 3.6	3.3	.21	11.26	2.83	4.34
June	23	2.0 to 2.3	2.1	3.2 to 3.6	3.3	.18	11.10	2.68	4.09
July.....	14	2.0 to 2.3	2.1	3.0 to 3.5	3.2	.17	11.65	2.62	4.05
August.....	27	1.9 to 2.4	2.1	3.2 to 3.8	3.4	.22	11.35	2.46	4.12
September...	13	2.0 to 2.5	2.2	3.2 to 4.1	3.6	.19	10.39	2.63	4.16
Totals and Averages ..	103	.....	2.08	.....	3.35	.19	11.13	2.63	4.00

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Comments.

During the season 103 tests were made for casein and fat. The highest percentage of casein found in any one vat was 2.5, the lowest 1.9. The highest percentage of fat in a vat was 3.8, the lowest 3.0. The averages were 2.08 and 3.35. The pounds of milk required to make a pound of cheese are high throughout the season.

High and Low Fat and Casein Milk Compared for Cheesemaking. Sixth Year's Tests.

The milk low in fat and casein was put in "A Vat" and that high in fat and casein put in "B Vat." There were 13 experiments in all, using 14,246 lbs. of milk.

"A Vat" contained a total of 7,123 lbs. milk, testing an average of 3.3 per cent. fat and 2.02 per cent. casein.

"B Vat" contained 7,123 lbs. milk, testing an average of 3.64 per cent. fat and 2.24 per cent. casein.

The experiments commenced May 13 and finished September 16th. The yield of cheese was lower than usual on account of the short season.

The results summarized are as follows:—

Vat	Lbs. green cheese.	Lbs. cheese one month old.	Lbs. shrinkage in one month.	Per cent. shrinkage in one month.	Lbs. cheese per 1,000 lbs. milk.	Lbs. milk per lb. cheese.
A	645.37	624.53	20.84	3.22	87.67	11.40
B	684.51	664.20	20.31	2.95	93.24	10.72

Vat.	Lbs. cheese per lb. fat in milk.	Lbs. cheese per lb. casein in milk.	Average per cent. fat in cheese.	Average % moisture in		Average per cent. fat in whey.
				Green cheese.	Cheese one month old.	
A	2.64	4.40	35.14	35.5	35.37	.18
B	2.94	4.14	35.75	35.54	35.23	.22

Score of Cheese.

Vat.	Flavor 40.	Closeness 15.	Even color 15.	Texture 20.	Finish 10.	Total 100.
A	36.71	13.90	14.0	17.28	10	91.89
B	36.57	13.94	13.97	16.90	10	91.38

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Assuming that cheese nets 10 cents per lb. and that A and B are two patrons of a cheese factory for the season, the following amounts of money would be credited according to five plans or systems:—

Weight of milk or "Pooling" plan	A. Cr.	$66.49	B. Cr.	$66.49
Fat plan	" "	63.42	" "	69.56
Fat plus 2 plan	" "	64.48	" "	68.49
Fat plus casein plan	" "	63.22	" "	69.74
Actual cheese	" "	64.53	" "	68.45

Conclusions.

1. The difference in actual weight of cheese produced was 5.57 lbs. more cheese per 1,000 lbs. milk from the higher testing casein-fat lots. Last year the difference was 5.53. The results agree with previous work, which showed a gain, per 1,000 lbs. of milk, of 4.6 to 6.4 lbs. cheese by using milk testing higher percentages of casein and fat.

2. The cheese made from the higher testing milk also contained a higher percentage of fat. This agrees with the previous two years' work.

3. There was not much difference in the percentages of moisture contained in the green or ripe cheese from the two lots. This also agrees with previous work.

4. There was not much difference in the quality of the cheese, as shown by the scorings. The A lots made from the lower testing milk averaged about half a point higher. Last year the B lots or higher testing milk cheese scored slightly higher.

5. Applying each of five systems, or methods of paying patrons, to these tests, we find that the plan of "fat plus 2" comes nearest to the value of the actual cheese produced. This also agrees with previous work done on this point and indicates that if it is not convenient to test milk for casein, or the combined fat and casein, fat alone may be determined and the casein approximately estimated by adding the factor 2, for dividing money from cheese sales among patrons.

Effect of Acid at the Time of Adding the Rennet to Milk.

There were seven experiments made in all, using 8,006 lbs of milk, testing 3.34 per cent. fat and 2.1 per cent. casein. This is the fourth year for these tests.

The milk was thoroughly mixed then divided into two lots. The A vats were ripened above normal; the B vats were as near as possible normal. The experiments began May 16th and finished on September 11th, 1913.

Conclusion.

The results are similar to those got last year. There was very little difference in yield or quality of cheese in the two lots—one set at .21 and the other with an average of .177 per cent. acid.

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	A (overripe)	B (normal)
Lbs. Milk	4,003	4,003
Acid at setting ..... per cent.	.21	.177
Acid at dipping ..... per cent.	.172	.174
Acid at milling ..... per cent.	.717	.714
Acid at salting ..... per cent.	.909	.961
Hours in whey	1 hr. 33 min.	2 hrs. 38 min.
Hours from dipping to salting	3 hrs. 59 min.	4 hours
Loss of fat in whey ..... per cent.	.2	.18
Green cheese ..... lbs.	378.51	378.93
Ripe cheese ..... lbs.	369.35	369.07
Shrinkage ..... lbs.	9.16	9.86
Shrinkage ..... per cent.	2.42	2.60
Cheese per 1,000 lbs. milk ..... lbs.	92.24	92.22
Milk required per lb. cheese ..... lbs.	10.83	10.84
Score of Cheese.		
Max.		
Flavor 40	37.16	37.29
Closeness 15	14.12	13.91
Even color 15	14.08	14.02
Texture 20	17.16	17.12
Finish 10	10	10
Total 100	92.52	92.34

Note.—It should be borne in mind that these tests were made with comparatively small quantities of milk, which were under control of the cheesemaker, and were ripened with a pure culture.

Over-ripe Milk Compared with Normal Milk for Cheesemaking.

	A (overripe)	B (normal)
Lbs. milk in vat	15,235	9,706
Per cent. fat	3.41	3.41
Per cent. casein	2.19	2.19
Acidity at setting ..... per cent.	.234	.178
Time in whey	53 min.	2 hrs. 36 min.
Acidity at dipping ..... per cent.	.178	.17
Green cheese ..... lbs.	1,341.58	900.39
Ripe cheese one month old ..... lbs.	1,300.58	876.89
Shrinkage ..... lbs.	41	23.50
Shrinkage ..... per cent.	3.05	2.60
Cheese per 1,000 lbs. milk ..... lbs.	88.08	92.77
Milk required per lb. cheese ..... lbs.	11.71	11.06
Moisture in green cheese ..... per cent.	35.66	34.8
Moisture in cheese one month old ..... per cent.	35.22	34.8
Loss of moisture in one month ..... per cent.	.44	0
Average Score of the Cheese.		
Max.		
Flavor 40	36.19	37.14
Closeness 15	14	13.89
Even color 15	13.80	14
Texture 20	16.55	17.17
Finish 10	10	10
Total 100	90.54	92.20

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This is the sixth year we have conducted these tests. There were eighteen experiments made, using altogether 24,941 lbs. milk. There were 15,235 lbs. milk used in A vat, or the over-ripe lots, testing an average of 3.41 per cent. fat and 2.19 per cent. casein, and 9,706 lbs. of milk used in B vat, or in the normal milk lots, averaging the same as the A lots—3.41 per cent. fat and 2.19 per cent. casein.

Conclusions.

1. The over-ripe milk lots which averaged the same percentages of fat and casein as did the normal lots, 3.41 and 2.19 respectively, produced 4.69 lbs. less cheese per 1,000 lbs. milk. This is a greater difference than we have had in the past, where the difference was from 2.2 to 2.5 lbs. per 1,000 lbs. milk in favor of the normal lots.

There was required on the average .65 lb. more milk to make a pound of cheese from the over-ripe milks as compared with the normal milks.

2. The shrinkage during one month was nearly one-half per cent. greater in the lots of cheese made from over-ripe milk as compared with cheese in the normal lots.

3. Contrary to expectations, the moisture in both green and ripe cheese was slightly higher in the cheese made from the over-ripe milks.

4. The quality of the cheese was inferior made from the lots of over-ripe milk. The average difference in flavor was nearly one point in favor of the normal lots. The normal lots also scored an average of 1.66 point higher on the total score.

5. The practical lesson to be learned from these six years' experiments is the importance of keeping milk sweet by cooling it before delivery to the cheese factory, as sweet milk will make more cheese and cheese of better quality as compared with similar milk over-ripe, or which has two-tenths per cent., or over, of acidity developed before the rennet can be added by the cheesemaker at the factory.

COMPARISON OF THE EFFECT OF DIFFERENT AMOUNTS OF SALT ADDED TO CURDS.

Seven thousand five hundred and eighty pounds of milk were used in all, testing an average of 3.5 per cent. fat and 2.16 per cent. casein. There were eight experiments made with low and medium salting; five for the heavier salted lots. The milk was handled in one vat, up to salting, when the curd was divided into two or three lots. The A lots were salted in the early part of the season at the rate of 2 lbs. per 1,000 lbs. milk; B lots, 2¼; C lots, 2½. Later the salt was increased to 2¼ lbs. in A; 2½ lbs., B.; 2¾ lbs. for C:—

	Weight of cheese.			Per cent of moisture in cheese.		
	Low salting A.	Medium B.	High.	A.	B.	C.
	Lbs.	Lbs.	Lbs.			
Green	266.13	267.20	158.49	35.3	35	34.5
Ripe	258.76	261.14	153.94	35.2	35	34
Shrinkage	7.37	6.06	4.55	.1	0	.5
Per cent shrinkage....	2.76	2.38	2.87	.....	.....	.....

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AVERAGE SCORE OF CHEESE.

	Flavor 40.	Closeness 15.	Even color 15.	Texture 20.	Finish 10.	Total 100.
A	36.83	14	14.04	17.20	10	92.07
B	37	14.08	14	17.12	10	92.20
C	36.92	14.14	14.07	16.78	10	91.91

Conclusion.

The cheese from the curds salted highest contained slightly less moisture and scored slightly lower, although there was not much difference in the average quality of the cheese made from the three rates of salting the curds.

MOISTURE IN CHEESE DETERMINED WEEKLY FOR ONE MONTH AT THREE POINTS IN EACH CHEESE, ONE KEPT AT 40° AND THE OTHER AT 60° TO 75°F.

Date.	Cheese ripened in ice-cold storage at 40° F.						Cheese ripened in ordinary room 60° to 70° F.					
	Weight green cheese.	Per cent. moisture in—					Weight green cheese.	Per cent. moisture in—				
		Green cheese.	1st inch.	2nd inch.	3rd inch.	Averages.		Green cheese.	1st inch.	2nd inch.	3rd inch.	Averages.
	Lbs.						Lbs.					
April 18..	65	36	.....	.....	.....	.....	62.75	35.2	.....	.....	.....	.....
.. 28..	.....	.....	35.4	36	35.7	35.70	.....	.....	34	34.9	35	34.63
May 6..	.....	.....	34	36	35.5	35.16	.....	.....	31.9	35	34.8	33.90
.. 13..	.....	.....	34.2	35.6	36	35.26	.....	.....	30	34.8	35	33.23
.. 20..	.....	.....	32.8	36	36	34.93	.....	.....	30.5	34.8	35	33.43
.. 28..	.....	.....	33.4	36	35.8	35.06	.....	.....	30.1	34.8	35	33.30
Averages ...	.....	.....	33.96	35.92	35.8	35.22	.....	.....	31.3	34.86	34.96	33.70
May 28..	78.25	34.8	.....	.....	.....	.....	71.5	34.2	.....	.....	.....	.....
June 4..	.....	.....	33.4	33.8	34.9	34.03	.....	.....	33.7	34.4	34	34.03
.. 11..	.....	.....	31.5	33.8	33.8	33.03	.....	.....	33	33.7	34.2	33.63
.. 18..	.....	.....	31.5	33.8	33.6	32.96	.....	.....	29.5	34.2	34	32.56
.. 26..	.....	.....	29.7	34	33.8	32.50	.....	.....	29.8	33.9	34.3	32.66
Averages ...	.....	.....	31.52	33.85	34.02	33.13	.....	.....	31.5	34.05	34.1	233.22
July 21..	68.88	35	.....	.....	.....	.....	74.5	35	.....	.....	.....	.....
.. 28..	.....	.....	33.8	35	35	34.60	.....	.....	33.6	34.8	35	34.46
August 5..	.....	.....	32.6	35.2	35	34.26	.....	.....	31.6	34.4	34.8	33.60
.. 12..	.....	.....	31.8	35	35	33.93	.....	.....	30.4	35	34.8	33.40
.. 19..	.....	.....	32.7	35	35	34.23	.....	.....	31.2	34.5	34.7	33.46
Averages ...	.....	.....	32.72	35.05	35	34.25	.....	.....	31.7	34.67	34.8	33.73
Septem. 8..	69	34.6	.....	.....	.....	.....	75	34.6	.....	.....	.....	.....
.. 15..	.....	.....	33.7	34.1	34.2	34.00	.....	.....	33.2	34.6	34.4	34.06
.. 22..	.....	.....	31.6	33.9	34.4	33.30	.....	.....	30.6	34.4	34.6	33.20
.. 29..	.....	.....	*33	34.2	34.4	33.86	.....	.....	*33.0	35	35	34.33
October 5..	.....	.....	32.8	33.9	34.6	33.76	.....	.....	29.6	34.8	34.6	33.00
Averages ...	.....	.....	32.77	34.02	34.4	33.73	.....	.....	31.6	34.7	34.65	33.65

* Cheese turned after standing in same position from time of placing on shelves.

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Conclusions.

1. As was the case in two previous years, when similar experiments were conducted the cheese ripened in the ice cold-storage retained more of the original cheese moisture during the month of testing.

2. The most of the moisture loss took place in both lots for each experiment during the first week and in the first inch of the cheese from the surface inward.

3. The results of the three years' work agree in showing that the moisture near the centre of the cheese remains fairly constant during a ripening period of one month, whether the cheese were ripened in cold-storage at 40°F., or in a room where the temperature ranged from 60° to 75°F.

Ripening Cheese in Cold Room *vs.* Ordinary Room.

This is a continuation of the work done in previous years on this question. The milk was put into one vat and made into three cheese. The A cheese was taken directly from the hoop to an ice cold-storage and not turned. The B cheese was placed in the ordinary room for one week then placed in the cold room. The C cheese was left in the ordinary room for one month.

There were twelve experiments made, commencing April 16th and ending Aug. 29th, using in all, 16,537 lbs. milk testing an average of 3.37 per cent. fat and 2.2 per cent. casein. The average percentage of fat in the whey was .17.

In addition to the weights of cheese given there were 292 lbs. of ripe cheese made at various times in excess of what could be conveniently divided into three cheese from one test:—

—	Green Cheese Lbs.	Ripe Cheese Lbs.	Shrinkage.		Moisture in	
			Lbs.	%	Green Cheese %	Ripe Cheese %
A.....	445.00	434.73	11.27	2.53	34.92	34.7
B.....	321.89	313.63	8.26	2.57	34.72	34.63
C.....	448.69	436.37	12.32	2.74	34.9	34.5

Score of the Cheese.

—	Flavor.	Closeness.	Even Color.	Texture.	Finish.	Total.
A.....	37.39	14.22	14.73	17.86	10	94.20
B.....	37.37	14.12	14.13	17.59	10	93.21
C.....	36.35	13.70	13.96	16.5	10	90.51

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Conclusions.

1. The difference in shrinkage was not so great as last year, the saving being about one-quarter of one per cent., as compared with one-half per cent. in 1912, in favor of ripening in the cold room at about 40°F. The ordinary room ranged from 60° to 75°F. in temperature.

2. All the lots contained about the same percentage of moisture in green and ripe cheese.

3. The A lots placed at once in the cold-storage averaged one point higher in score as compared with the B lots and nearly four points higher as compared with the C lots. Last year there was very little difference in the A and B lots. Ripening cheese at a comparative low temperature gives better results.

Pasteurized Milk Cheese.

A few tests were made using pasteurized milk, treated with hydrochloric acid, for the manufacture of Cheddar cheese. Directions were followed as closely as possible according to the plan suggested by an American Experiment Station. The resulting cheese were not very satisfactory. Mr. Frank Herns, who scored all our experimental cheese, remarked on the peculiar flavor of the pasteurized milk cheese, and also upon the weak body and texture of the cheese, which were "pasty" in condition.

According to Canadian standards, these cheese made from pasteurized milk would not be at all suitable for the export trade, though they might sell on the local market at a fair price.

We hope to make further tests next year.

Soft Fancy Cheese.

The following is a report on the experimental work done in the Soft Cheese Branch of the Dairy Department, for 1913, as given by Miss Belle Millar, who is in charge of this branch. Soft cheesemaking and the proper utilization of dairy by-products is a line of growing importance in the dairy industry. In all cases under "days," is meant the number of days during which the cheese kept in good condition, in the place or package, or at the temperature given.

Keeping Experiments with Camembert Cheese.

Average of five experiments with Camembert cheese kept in cold storage and in cellar (May-Sept., 1913.)

Place.	No. of days Cheese kept in good condition.	Average Temperature.
Cold Storage.....	14.6	40.1°
Cellar.....	5.6	57.0°

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Average of two experiments with Camembert cheese kept in four different places. (July, 1913.)

Place.	Days.	Average Temperature.	Average Humidity.
			%
Cold storage	13.5	41.4°	96.8
Refrigerator	11.0	49.6°	70.1
Cellar	4.0	63,1°	85.0
Soft Cheese Room	3.5	71.8°	66.8

KEEPING EXPERIMENTS WITH GERVAIS CREAM CHEESE.

Average of three experiments with Gervais cream cheese kept in cold storage and cellar.

Place.	Days.	Average Temperature.
Cold storage	17.6	42.5°
Cellar	6.0	61.5°

Average of two experiments with Gervais cream cheese kept in four different places.

Place.	Days.	Average Temperature.	Average Humidity.
			%
Cold Storage	19	42.0°	95.2
Refrigerator	14	50.8°	70.0
Cellar	5	63.2°	84.4
Soft Cheese Room	4.5	71.1°	68.6

KEEPING EXPERIMENTS WITH DOUBLE CREAM CHEESE.

Average of four experiments with Double Cream Cheese kept in cold storage and in cellar. (May-Sept., 1913.)

Place.	Days.	Average Temperature.
Cold storage	20.7	41.2°
Cellar	8.7	58.70°

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Average of two experiments with Double Cream Cheese, kept in four different places. (July, 1913.)

Place.	Days.	Average Temperature.	Average Humidity.
			%
Cold storage	22	41.9°	94.8
Refrigerator	17.5	51.9°	69.1
Cellar	6.5	63.1°	84.4
Soft cheese room	5.5	72.0°	66.8

Soft Cheese Package Experiments.

Five experiments were carried out with Camembert, Double Cream and Gervais Cream Cheese to ascertain the relative value of different kinds of packages. The cheese were put up in glass jars, rice paper and tinfoil, and rice paper and cardboard boxes and their keeping qualities noted.

Name of Cheese.	Package.	Ex. No. 1. (Refrig.)	Ex. No. 2. (Refrig.)	Ex. No. 3. (Cellar.)	Ex. No. 4. (Cold-storage.)	Ex. No. 5 (Cellar.)	Average of Five Expts.
		No. Days.	No. Days.	No. Days.	No. Days.	No. Days.	No. Days.
Camembert ...	Glass.	14	14	6	16	10	12.0
Camembert ...	Tinfoil....	13	9	4	9	5	8.0
Camembert ...	Box	13	9	4	10	5	8.2
Double Cream.	Glass	21	16	9	22	13	16.2
Double Cream.	Tinfoil....	21	14	7	15	10	13.4
Double Cream.	Box	21	14	7	16	11	13.8
Gervais.	Glass.	17	17	8	17	12	14.2
Gervais.	Tinfoil....	20 (1)	14	5	14	7	12.0
Gervais.	Box	14	14	5	15	8	11.2

NOTE.—In the case of the Gervais in tinfoil in Exp. No. 1, the papers got torn when the cheese was being examined and fresh dry papers were put on. This may account for the greater keeping qualities in this instance. With this exception, the tinfoil and boxes were equal in nine cases and the boxes superior to the tinfoil in five cases.

In all cases the keeping qualities of the cheese in glass jars was the greatest, but the extra cost of package and the greater care in shipping are necessary considerations.

Whey Experiments with Camembert Cheese.

Comparing the loss of fat in the whey in making Camembert Cheese from raw and pasteurized milk:

Kind of Milk.	Exp. No. 1. % fat in whey.	Exp. No. 2. % fat in whey.	Exp. No. 3. % fat in whey.	Exp. No. 4. % fat in whey.	Av. of four experiments.
Raw.....	.01	.015	.02	.015	.015
Pasteurized.....	.005	.005	.01	.02	.010

There was very small loss in each case.

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Double Cream Cheese.

Comparing the loss of fat in the whey in making Double Cream Cheese from raw and pasteurized cream:

Kind of Cream.	Exp. No. 1. % fat in whey.	Exp. No. 2. % fat in whey.	Exp. No. 3. % fat in whey.	Exp. No. 4. % fat in whey.	Exp. No. 5. % fat in whey.	Average of five experiments.
Raw	.08	.12	.60	.44	.12	.272
Pasteurized....	.08	.35	.26	.03	.42	.228

Other factors that may influence the loss in the whey are: acidity, coagulation, stage at which it was ladled.

Neufchatel Cheese.

Neufchatel Cheese was made six times during the summer season and was well liked by those who tried it.

The morning's milk was pasteurized and cooled to 70 deg., and to 10 lbs. milk was added 1 lb. of 30 per cent. cream and 4 oz. of culture. This mixture was stirred occasionally and in about six hours the rennet was added.

If the milk had cooled the temperature was brought back to 70 deg. and ½ c.c. coloring and 1 c.c. rennet was added. This was covered and allowed to stand undisturbed for about 18 hours.

The curd which was now firmly coagulated was dipped out and placed on a draining rack. When all free moisture had drained from it light pressure was applied. This was done by rolling the curd in cheesecloth and placing it between two boards with a weight on top.

When sufficiently drained, salt was applied at the rate of 1 oz. of salt to 3 lbs. of cheese. This was thoroughly mixed to insure an even distribution. After allowing it to stand until the salt was dissolved it was put up in blocks similar to the Double Cream Cheese, that is one inch thick, 3½ inches long and 2 inches wide.

Keeping Experiments with Neufchatel Cheese.

The Neufchatel cheese compared very favorably with other kinds of soft cheese as regards keeping qualities.

Average of two experiments with Neufchatel Cheese kept in cold storage and in the cellar:

Place.	Days.	Av. Temp.	Av. Humidity.
Cold Storage.....	18.5	43.2°	91.5%
Cellar.....	8.5	61.3°	83.5%

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One experiment was made with Neufchatel Cheese kept in four different places.

Place.	Days.	Av. Temp.	Av. Humidity.
Cold Storage	22	42.2°	93.7%
Refrigerator	14	52.2°	68.4%
Cellar	7	64.3°	84.8%
Soft Cheese Room	7	74.0°	65.0%

BUTTERMILK CHEESE.

Ex. No.	Kind of Buttermilk.	Yield of cheese per 100 lbs. buttermilk	Remarks.
		lbs.	
1	Ripened cream, raw	15	Good grain.
2	" " past.	16	A little pasty.
3	Ripe cream, past. 25% culture added to buttermilk.	18	Grain better than No. 2. Flavor good.
4	Ripe cream, past.	2.5	Most of it went through the cheesecloth. Remainder was soft and fine like white paint.
5	Ripe cream, past. 25% culture was added to buttermilk.	12.5	Some went through the cheesecloth. Coagulation better than in No. 4. Rather pasty.
6	Ripe cream, past. 25% skimmilk was added to buttermilk.	15.6	Pasty, fine grain, too moist.
7	Ripe cream, past. Buttermilk and skim-milk used in equal quantities.	14.3	Good-drained rather dry. Adding cream to this cheese would improve it
8	Ripe cream, past. Buttermilk and skim-milk used in equal quantities.	16.8	Good. On account of the large percentage of skim-milk added the mixture was only brought to 110° at 2nd heating.
9	Sweet cream, past. and culture added to cream to ripen it.	14.3	Good-more like cottage cheese.
10	Sweet cream, past. and culture added to cream to ripen it.	15.6	Good-colour and texture more like cottage cheese.
11	Sweet cream, ripened with culture, raw.	12.5	Coagulation fine. Rather pasty.
12	Ripened cream, raw.	13.7	Fairly good-rather moist.
13	Ripened cream, past.	0	All went through cheesecloth.

The buttermilk cheese was made by heating the buttermilk to 80 deg. Fahr. stirring just enough to insure even heating. This was allowed to stand for an hour then it was again heated, with little stirring, to a temperature of 130 deg. In about an hour this was drained by pouring it on a cheesecloth placed over a strainer. To assist in draining one end of the cheesecloth was lifted, causing the curd to roll over, then the other end was lifted in the same way.

When sufficiently drained, salt was added at the rate of 1 oz. salt to 3 lbs. cheese.

In some cases cream was added, allowing 1 oz. cream to 1 lb. cheese.

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In making buttermilk cheese the results depended, to a great extent, on the kind of buttermilk used.

Cream that was pateurized sweet gave good results, while cream that was ripe or partially ripened before pasteurizing gave as a rule poor returns. It was often very fine in grain and pasty and in some cases there was no coagulation but all would pass through the cheesecloth like milk.

When ripened cream was divided and one lot churned raw and the other lot pasteurized, the grain and texture of the cheese from the raw was better than that from the pasteurized, although, as a rule, the flavor of the raw buttermilk cheese was inferior.

Keeping Experiments with Buttermilk Cheese.

Experiments were made with Buttermilk cheese to compare the keeping qualities with other kinds of soft cheese.

The table below gives the average of a number of experiments.

Place.	No. Experiments.	Days.	Av. Temp.
Cold Storage	2	19	38.9°
Refrigerator	2	13.5	51.2°
Cellar	3	6	58.9°
Soft Cheese Room	3	4	67.3°

As the demand for fancy cheese for sandwiches, etc., is growing, the question was raised whether the addition of such flavorings as pimentos, olives, etc., would add to, or take from, the keeping qualities of buttermilk cheese.

Two experiments were made with pimentos. In each case the cheese was divided and pimentos added to one half and cream to the other, having both lots about the same consistency as regards moisture.

In each experiment the cheese with the pimentos kept as long as that with cream.

Place.	Days.	Av. Temp.	Av. Humidity.
Refrigerator	15	52.2°	68.4%
Cellar	6	64.3°	84.8%

Cottage Cheese.

The skimmilk for making Cottage Cheese was handled the same as when making cultures, that is, it was pasteurized, cooled and culture added then allowed to stand undisturbed until the next day when it was nicely ripened and coagulated. This was then heated to 100 deg., and afterwards drained by placing the curd on a draining rack, which rack was previously covered with a cheesecloth. Similar results can be obtained by hanging the curd in a cheesecloth. After draining, salt was added at the rate of 1 oz. to 3 lbs. of cheese.

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In some cases cream also was added using about one ounce cream to 1 lb. cheese. This varied according to the consistency of the cheese, as a dry crumbly cheese required more cream.

A person making Cottage Cheese for the market would find a small cheese vat with steam connections very suitable. The curd could be cut with curd knives and a butter printer used for putting the cheese up in bricks, or else the cheese could be sold in bulk, using packages such as are used for ice cream or oysters.

Stilton Cheese Experiments.

These tests were conducted during the season of 1912, under the supervision of Mr. N. S. Golding. These cheese were not ready to test at the time of preparing the Annual Report for 1912, as it takes about six months for Stilton cheese to get the proper "veining" and become ripened to a buttery consistency which are characteristics of that variety.

From these tests it would seem as if either the "cloth" or curd-knife method will give fairly satisfactory results. The Wensleydale system seems to produce a cheese which is much harder and drier than the other two systems, and the cheese requires a longer time to ripen.

Two tests were made by inoculating one Wensleydale curd with mouldy bread crumbs, to see if this would start the blue mould (*Penicillium glaucum*) sooner, as compared with a similar curd not inoculated. The tests were inconclusive. In one case the not inoculated curd showed blue mould in the cheese sooner than did its mate which was inoculated. In the other test, conditions were reversed, and the inoculated curd developed blue mould in the cheese sooner than did the not inoculated.

As we said last year, we may repeat: "Up to the present, Stilton cheese manufacture in Canada appears to be in the experimental stage. Whether or not we shall be able to make a uniformly good cheese equal to the English Stilton, remains to be seen."

Cloth Method of Making Stilton Cheese.

Take 130 lbs. of milk (which must be new morning's milk) cool to 84°, add a dram or two of culture and then rennet. Add from three to four drams of rennet (depending upon the milk and rennet) in ten times its volume of cold water and stir for about five minutes. Allow to set for one hour. When the curd is a little firmer than usual, cut with a curd knife, ladle into four or five cheesecloths, wrung out of warm water, in a curd sink. Then allow to stand in a curd sink for about one hour and tie up. When an acidity between .11 and .12 per cent. has developed run off the whey. Tighten the cloths every hour so as not to get too flat a mass of curd. After a certain firmness is reached, which gives an acid test of .18 to .24 per cent. in the whey from the cheesecloth, turn the curd out of the cheesecloths into the curd sink. An hour later when an acidity of about .25 is attained, (depending on the firmness of the curd) the curd is cut up into three-inch blocks so as to facilitate draining. Later on turn over and separate the blocks of curd.

When an acidity of .33 to .40 per cent. is reached, the curd is broken and salted at the rate of 1 oz. to 3 lbs. of curd. Leave for a few minutes for the salt to dissolve, place the curd in the hoops and turn.

Note: The process should take from 10 to 14 hours, depending mostly on the temperature of the room.

All the milk used in the experiments was obtained from the morning milkings of the College Dairy Herd for both the Cloth and Curd-knife experiments.

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STILTON CLOTH METHOD.

Date.	Lbs. Milk.	% Fat.	Culture added.	Rennet added in drams	Time ladled out. a.m.	% fat in whey	% Acidity at salting.	Time at salting. p.m.	Lbs. curd.	Rate of salt.	Lbs. cheese at two weeks	Lbs. ripe cheese	Lbs. cheese per 100 lbs. milk.	Lbs. cheese per lb. fat in milk.	Remarks.
					H-M			H-M							
May 16...	130	3.1	½ oz.	3½	9-40	.....	.47	7-45	21	1 oz.-3 lb.	12.88	8.75	6.7	2.17	Good cheese.
" 23...	130	3.8	½ oz.	3½	9-50	.16	.37	5-40	23	1 oz.-3 lb.	13.50	9.50	7.3	1.92	Good.
" 30...	130	4.6	½ 8z.	4	9-40	.....	.38	9-0	27.5	1 oz -3 lb.	17.5	11.50	8.8	1.92	Poor flavor—soft.
June 6 ...	130	4.1	½ oz.	4	9-12	.11	.40	10-10	26.0	1 oz.-3 lb.	16.25	11.18	8.6	2.09	A cull cheese; slimy fermentation.
" 13...	130	4.0	½ oz.	3½	9-10	.....	.38	10-50	27.5	1 oz.-3 lb.	16.63	11.75	9.0	2.25	A cull cheese; contained too much moisture.
" 20...	130	3.2	½ oz.	3½	9-15	.08	.48	6-20	24	1 oz.-3 lb.	13.75	9.93	7.6	2.38	Good cheese. Slightly bitter after-taste.
" 27...	130	3.6	½ oz. (weak)	3½	9-7	.11	.41	9-35	26	1 oz.-3 lb.	14.5	10.25	7.8	2.19	Cheese had an old milk flavor.
July 4....	130	3.6	½ oz.	4	9-10	.12	.49	4-10	26	1 oz. to 2¾ lbs.	12.56	9.25	7.1	1.97	Curd very gassy. Flat flavor. Rather dry cheese.
" 11...	130	3.9	1 oz.	4	9-15	.20	.45	4-45	28	1oz. to 3 lbs.	13.88	10.25	7.8	2.02	Cheese good flavor and texture.
" 18...	120	3.6	½ oz.	3¾	9-10	.12	.36	6-40	24	1oz. to 3 lbs.	13.19	11.00	9.1	2.54	Curd gassy and poor flavor. Cheese crumbly and dry, but improved as it ripened.
" 25...	120	3.8	4 oz.	3¾	9-20	.10	.50	4-40	25	1oz. to 3 lbs.	12.81	8.00	6.6	1.75	A good cheese, although it developed somewhat bitter flavor.
Aug. 22 ..	130	4.0	½ oz.	4	9-6	.25	.44	5-0	26.5	1oz. to 3 lbs.	13.44	9.75	6.1	1.53	Good cheese. Buttery.
Averages .	128.3	3.77	.....	.....	.....	.14	.427	.....	25.4	.....	14.24	10.09	7.7	2.05	

Average time between setting and ladling, 1 hr. 7½ mins.
" " " ladling and running off whey, 4 hrs. 14½ mins.
" " " running off whey and salting, 5 hrs. 28 mins.

Temp. set 84° to 85°.
Acidity when setting .16 to .18.
" " dipping .10 to .12.

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Curd-Knife Method of Making Stilton Cheese.

Take 130 lbs. milk (that must be new morning's milk) cool to 84 degrees F. and add 1 to 2 drams of culture. Next add rennet at the rate of 3 to 4 drams of rennet extract diluted in ten times its volume of cold water, depending on the milk and condition of the rennet; stir the rennet well in for five minutes, allow to stand for about fifty minutes and then cut, first one way with the horizontal knife and then both ways with the vertical. Leave to stand for about one hour; weight the curd with a rack and light weight to expel moisture and allow to mat. When the acidity has reached .11 to .12 per cent. the whey is run off; in about one hour the rack is removed and a channel opened so as to increase the draining of moisture. In one hour or a little later the curd is cut into cubes and turned. It is turned every hour until the whey from it has an acidity of .33 to .41 per cent. The curd is then broken and salted at the rate of 1 oz. to 3 lbs. The curd is left for a few minutes to dissolve the salt and then put in the hoops and turned. This process takes about two hours less than the cloth method.

Method of Making Wensleydale Cheese.

Take 130 lbs. mixed night and morning's milk, add about 4 oz. culture, depending upon the condition of culture and milk, heat to a temperature of 84 degrees F. Wait until the milk has reached an acidity of .17, then add one dram of rennet to 30 lbs. milk in not less than ten times its volume of cold water, and stir in for three or four minutes. Leave to set for about forty to fifty minutes; when firm enough, cut with the horizontal curd knife one way and with the vertical knife both ways. Stir the curd very gently for a few minutes then clean off the sides of the vat. For the next 2½ hours the curd should be sufficiently stirred to prevent matting and the temperature gradually raised to 88 degrees F. When an acidity of .15 to .16 per cent. has been reached the whey is run off, the curd dipped and put on a rack in a vat with the cheesecloth underneath; cover with cloth. The curd mats and in twenty minutes it is cut into three inch blocks and turned every twenty minutes so as to keep the curd at an even temperature till an acidity of about .4 per cent. to .5 per cent. has developed. The curd is then milled and the salt is added at the rate of 1 oz. to 4 lbs of curd and stirred well in. Leave the curd for a few minutes for the salt to dissolve and then place in the cheese mould with a cloth around it. Turn the cheese the same evening and apply a moderately high pressure—about 400 lbs. to each cheese. Next day bandage the cheese and put it in the ripening room.

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STILTON CHEESE CURD-KNIFE METHOD.

Date.	Lbs. Milk.	% Fat.	Rennet in Drams.	% fat in whey at dipping.	Acidity at salting.	Time at salting. p.m.	Lbs. Curd.	Rate of Salt.	Lbs. of Cheese at two weeks.	Lbs. ripe Cheese.	Lbs. Cheese per 100 lbs. milk.	Lbs. Cheese per lb. fat in milk.	Remarks.
1912													
June 6	130	3.7	4 dr.	.12	.46	8.0	28.5	1 oz. to 31b curd.	15.75	10.50	8.0	2.18	Good cheese.
" 13	130	4.0	3½ "	.....	.45	8.45	26.5	"	13.88	10.00	7.6	1.92	Good flavor and texture.
" 20	130	3.1	3½ "	.05	.58	7.8	24.	"	13.25	9.00	6.9	2.23	Cheese good.
" 27	130	3.6	3½ "	.05	.47	7.25	26.5	"	14.00	10.00	7.6	2.13	Good flavor and texture.
July 4	130	3.7	4 "	.03	.58	3.50	24	1 oz. to 2¾ lb. curd.	11.56	8.75	6.7	1.81	Very gassy curd—cheese fair, rather dry and flavor slightly bitter.
" 18	120	3.9	3¾ "	.04	.50	6.10	23	"	13.56	9.25	7.7	1.97	Gassy curd—poor flavor—cheese good flavor.
Aug. 22	130	3.5	4 "	.06	.40	5.15	26.5	"	12.19	8.50	6.5	1.86	Cheese good, buttery.
Average.	128.6	3.64	.....	.06	.463	.....	25.6	.....	13.45	9.42	7.2	2.013	

Average time between setting and cutting 53.1 min. Average time between dipping and salting, 5 hrs. 7 min.
Temperature setting 84° to 85°. Culture added ½oz. to ½ oz. Acidity of setting, .15 to .18. Acidity of dipping, .11 to .115.

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Wensleydale Cheese.

Date 1912.	Origin of milk.	Lbs. Milk.	% Fat.	Culture Added.	% Fat in whey.	Time at salting. p.m.	Lbs. Curd.	Rate of Salt.	Lbs. Cheese at two weeks.	Lbs. Ripe Cheese.	Lbs. Cheese per 100 lbs. Milk.	Lbs. Cheese per lb. fat in milk.	Remarks.
May 16	Farm mornings	130	3.5	4 oz.	.....	3-15 min.	17	1 oz. to 4 lbs.	12.75	9.87	9.8	2.16	Cheese good.
" 23	Farm mornings	130	3.8	4 oz.	.12	2-50	18.5	1 oz. to 4 lbs.	13.63	11.50	8.8	2.32	Cheese got damaged and was sold before it was ripe.
" 30	Farm mornings	130	4.4	4 oz.	.....	4-15	18	1 oz. to 4 lbs.	14.25	11.50	8.8	2.01	Cheese good.
June 6	Farm mixed ..	130	3.6	3 oz.	.16	2-30	16.5	1 oz. to 4 lbs.	13.50	10.50	8.0	2.24	" "
" 13	Farm mixed ..	130	4.0	3 oz.	.....	3-0	17.5	1 oz. to 4 lbs.	13.50	11.75	9.0	2.25	" "
" 20	Farm morning & cheeseroom milk	130	3.9	4 oz.	.12	2-30	17.5	1 oz. to 4 lbs.	13.75	11.50	8.8	2.07	" "
" 27	Farm mixed ..	130	4.0	6 oz. (weak)	.12	2-37	17.5	1 oz. to 4 lbs.	14.13	11.25	8.6	2.16	" "
July 4	Farm mixed ..	130	4.1	3 oz.	.15	1-40	18	1 oz. to 3½ lbs.	13.81	10.75	8.2	2.00	Very gassy curd with bad flavor.
" 10	Farm morning	130	3.7	5 oz.	.17	2-20	15.5	1 oz. to 4 lbs.	12.56	10.00	7.6	2.07	Good.
" 18	Farm mixed ..	120	4.2	4 oz.	.21	2-20	16	1 oz. to 4 lbs.	12.56	9.38	7.8	1.86	Curd slightly gassy.
" 25	Farm morning	120	3.9	½ oz.	.16	5-10	15	1 oz. to 4 lbs.	11.63	9.50	7.9	2.02	Good.
Aug. 22	Mixed cheeseroom milk	130	4.5	4 oz.	.28	2-40	18	1 oz. to 4 lbs.	14.38	11.00	8.4	1.88	No mould cheese fair.
Averages.....		128.3	3.97	.....	.....	.....	17.1	.....	13.37	10.71	8.47	2.086	The Wensleydale cheese were harder and drier than the Stiltons—took much longer to ripen.

Temperature renneted, 84 deg. to 86 deg. Acidity at renneting, .16 to .19 per cent. Temperature cooking, 88 deg. to 90 deg. Acidity at dipping, .14 to .15 per cent. Acidity at salting, .38 to .55 per cent.

Average time between renneting and cutting, 50 mins. 7 sec. Average time of curd in whey, 3 hrs. 44.7 mins.

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ICE CREAM EXPERIMENTS.

The following is Mr. Brown's Report on Ice Cream Experiments, July 7th to 24th, 1913:

In order to answer the frequent inquiries, which have come to us, upon the subject of ice cream manufacture, the Dairy Department, during three weeks in July, 1913, conducted a number of experiments and made preliminary studies on the following points:—

1. Factors causing "swell" or "overrun" and the rate possible with good results.
2. Factors causing smoothness or lack of same.
3. Factors favorable and necessary for a good shipping product.
4. Relative profits from ice cream manufacture compared with selling sweet cream for direct consumption or the manufacture of cream into butter.

In these experiments 506 lbs. of cream were used containing a total of 102.52 pounds of butter fat.

From the above amount of cream a total of 103.62 gallons of finished ice cream were made.

In the manufacture of 103.62 gallons of ice cream there were obtained percentages of overrun ranging from 52.0 to 95.0, the average being 69.6 per cent.

As the increase in volume or the "swell" during freezing is due almost entirely to the incorporation of air into the product, it stands to reason that the more viscid a cream is, the greater will be the swell, other things being equal.

If cream to be used for ice cream is pasteurized it should be heated not over 140 degrees F. and be held at that temperature for from 20 to 30 minutes, before cooling it to 40 degrees F. or below. Temperatures above 140 degrees F. cause the cream to become so thin that it does not regain sufficient viscosity within the reasonable length of time, through which it is safe to hold cream before being used.

Pasteurized cream should be held at 40 degrees F. or lower at least 24 hours and better 48 hours after being separated and before being used, to allow it to regain sufficient viscosity to make a reasonably high percentage of overrun. Even raw cream should be held at least 24 hours after being separated and before being used.

We obtained our highest percentage of overrun (95 per cent.) with raw cream used 72 hours after separation and held at 40 degrees F. during that time. The ice cream made from this raw cream was, however, of rather poor quality in texture, consequently lacking in smoothness and flavor owing to the incorporation of an excessive amount of air.

The rate of freezing, that is, the time which elapses in cooling the mix from 34 degrees to 28 degrees F., at which temperature it is ready to be drawn off, has much to do with the per cent. overrun obtained. The rate at which the mix cools depends upon several factors chief among which are, the temperature and rate of flow of the brine and the speed of the machine. The longer it takes then, (to a limited degree, not exceeding eight minutes) to cool the mix from 34 degrees to 28 degrees F. providing the machine is running the required speed, the more air will be whipped into the cream and consequently the higher will be the overrun. Stopping the flow of brine for a couple of minutes when the mix had reached a temperature of 34 degrees F., but with the machine left running,

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a greater per cent. of overrun was obtained. This latter point, however, needs further investigation and is not commended when a first class product is desired.

While contrary to the experimental work done at another station, we obtained, in the majority of cases, the highest per cent. of overrun by using creams with about 22 per cent. fat, as compared with those containing a lower per cent. of fat.

While the percentages of overrun obtained in these experiments ranged from 52 per cent. to 95 per cent. the rate possible with good results seems to be about 70 per cent. An overrun higher than 70 per cent. is secured with a corresponding inferior quality, while one much under 70 per cent. does not allow for a reasonable profit.

The chief factors causing smoothness in ice cream or lack of same, appear to be the percentage of fat in the cream used and the per cent. overrun. The rate of freezing of course also has something to do with it.

To show the effect of the first two of these factors upon the quality of the product a few samples were scored soon after the creams were hardened. The following table shows the possible and allotted scores together with the corresponding per cent. fat and overrun.

Possible Score.		Made July 21st.			Made July 22nd.			Made July 23rd.
Flavor	45	38	41	42	43	40	42	40
Texture	25	13	19	22	23.5	19	22	16
Richness	15	8	12	13	14	11	13.5	10
Appearance	10	6	8	9	8.5	9.5	9.5	7
Color	5	4	5	5	5	5	5	4
Total	100	69	85	91	95	83.5	92	77
Per cent. fat in cream		10	17	22	22	16	22	10
Per cent. overrun		52.6	62.1	81.2	66.8	52.3	80.9	80.9

The above table shows that with each batch of cream except one, the quality of the cream was improved as the per cent. fat in the cream used increased, or the overrun lessened, and vice versa. The higher per cent. overrun on the 10 per cent. cream used on July 21st was not accounted for unless it was due to the double amount of gelatine which was used in this case, the supposition of which would be contrary to the general belief.

Smoothness which is desirable in first class ice cream was only secured in those creams which had from 18 to 22 per cent. fat. What would otherwise be first class ice cream is often injured by the product becoming soft after it is put into the hardening can and then refrozen. The refreezing causes the product to become coarse and spiny in texture.

The main factors favorable and necessary for a good shipping product are, to have the cream well hardened before shipping and to have the cans sufficiently well packed with salt and crushed ice (proportion 1-12 to 15) to ensure the holding of the product in the hardened condition during transit. If the ice cream was not hardened thoroughly within twelve to fifteen hours after it was removed from the machine, we found it gave considerable trouble to harden it afterwards. If the cans were packed thoroughly for half an hour before the ice cream was taken from the machine and put into them and then repacked in an hour or two, the ice cream could easily be hardened in twelve to fifteen hours. The tubs in which the cans were packed were kept in cold-storage at a temperature of 40 degrees F.

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The relative profits from ice cream manufacture compared with selling sweet cream for direct consumption or manufacture of cream into butter, according to the work done in July of the past summer, may be summarized as follows:

Average cost of making Ice Cream:

Cost of butter fat per gal.	24.6c.
" " sugar per gal.	3.9c.
" " vanilla per gal.	2.3c.
" " gelatine per gal.	2.4c.
" " salt and ice per gal.	13.1c.
Total cost per gal.	46.3c.
Average selling price per gal.	90.00c.
" cost of ingredients, including ice and salt	46.30c.
Net profit per gal.	43.07c.

Value of butter fat if sold as ice cream:

Selling price of 1 gal. ice cream	90.0c.
Cost of materials, less fat	21.7c.
Amount received for butter fat in each gal.	68.3c.

Average amount of fat per gal. ice cream equals .98 lbs.
If .98 lbs. fat brings 68.3c.
1 lb. fat would bring 69.7c.

Value of fat if cream were made into butter:

If butter sells for 28c. per lb.
Fat would be worth 32.6c. per lb.

Value of fat is sold as sweet cream:

Per cent. fat in cream equals	22
Price received per quart	30c.
Lbs. fat in each quart	.55
If .55 lbs. fat sells for	30c.
1 lb. fat sells for	54.5c.

According to the above, the prices received per pound butter fat by manufacturing ice cream, butter or selling fat in sweet cream are respectively:

Ice cream 69.7c. per lb.
Butter, 32.6c. per lb.
Sweet cream, 54.5c. per lb.

(These were the current prices, July, 1913.)

The cost of labor was not considered in the above comparison.

The work done upon the foregoing questions during the past summer is preliminary.

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CREAM TESTING.

Comparison of Daily Testing with Composite Weekly, Semi-Monthly and Monthly Testing of Cream Samples.

This is the third year for these tests. In the season of 1913, but one patron's cream was used. Eeach time this patron's cream was delivered it was sampled and tested for fat. Samples were also taken for weekly, semi-monthly and monthly composite tests. The preservative used for composite samples was made of three parts potassium bichromate and one part corrosive sublimate; the quantity of preservative, what would lie on a five cent. piece. The samples were kept in the laboratory of the dairy building which ranged in temperature from 60 to 85 degrees F. The bottles for holding composite samples were ordinary pint milk bottles tightly stoppered. Nine gram samples for the Babcock test were used in testing.

The results were as follows:

Month.	Daily Tests. Average.	Weekly Tests. Average.	Semi-monthly Tests. Average.	Monthly Tests.
	% fat.	% fat.	% fat.	% fat.
May	33.25	33.0	33.0	33.0
June	31.68	31.75	32.5	31.75
July	31.84	32.06	32.0	32.0
August	43.08	43.50	43.0	43.0
September	32.80	32.83	32	33.0
Average for five months	34.53	34.62	34.5	34.55

Conclusion.

For three years we have had very close results from weekly, semi-monthly and monthly composite tests, as compared with testing each delivery. Any one of these methods may be regarded as practically correct, and will give patrons justice, if the work is done carefully and the sample bottles are kept properly stoppered to prevent evaporation.

Effects of Methods of Corking Compared with Open Bottles for Composite Cream Samples and also Effects of Temperature, Using Various Preservatives.

This is the third year for these tests. The samples were kept in two different places—in the laboratory where the temperature ranged from 60 degrees to 85 degrees F., and in an ice-cold storage where the temperature was about 40 degrees F. Composite sample bottles were stoppered with glass stoppers, cork, wood, paper caps, and one, left open. The preservatives used were, our regular 3:1 potassium bichromate, corrosive sublimate in large (what would lie on a five cent piece) and small (half a five cent piece quantity) amounts; and creosote, a preservative recommended by Dr. Walker, of Kingston.

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The results were as follows:—

SAMPLES KEPT IN ORDINARY ROOM, USING 3: 1 PRESERVATIVE. (LARGE AMOUNT.)

Month.	Glass.	Cork.	Wood.	Paper.	Open.
	% fat.	% fat.	% fat.	% fat.	% fat.
May	33	33	33	33	33
June	31.75	32	31.75	32	33
July	32	32	32	32	32
August	43	43	43	43.5	44.5
September	33	33	32.5	33	33
Average of five months	34.55	34.6	34.45	34.7	35.1

REMARKS.—Some mould each month, but much more in July and August; the glass-stoppered bottle showing the least and the open bottle the most mould.

SAMPLES KEPT IN COLD STORAGE, USING 3: 1 PRESERVATIVE. (LARGE AMOUNT.)

Month.	Glass.	Cork.	Wood.	Paper.	Open.
	% fat	% fat	% fat	% fat	% fat
May	33	33	32.75	33	33
June	31.5	31.75	31.75	31.25	31.5
July	32	32	32	32	32
August	43	43	43.5	43	43.5
September	33	33	32	32.5	33
Average of five months	34.5	34.55	34.40	34.35	34.6

REMARKS.—All kept in good condition. A very little mould in July and August.

SAMPLES KEPT IN ORDINARY ROOM, USING 3: 1 PRESERVATIVE. (SMALL AMOUNT.)

Month.	Glass.	Cork.	Wood.	Paper.	Open.
	% fat	% fat	% fat	% fat	% fat
May	33	33	33	33	34
June	31.75	31.5	32	32	33.5
July	.....	.....	.....	.....	.....
August	.....	.....	.....	.....	.....
September	33	33	32.5	33	33
Average of three months	32.58	32.5	32.5	32.66	33.5

NOTE.—July and August samples were so badly spoiled they could not be tested. During the other months all the bottles moulded heavily.

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SAMPLES KEPT IN ORDINARY ROOM, USING 5 C.C. CREOSOTE.

Month.	Glass.	Cork.	Wood.	Paper.	Open.
	% fat	% fat	% fat	% fat	% fat
May	33	33	33	33	34
June	32	32	32	32	33
July	32	32	32.25	32.5	34
August	43	43	43	43.5	44
September	33.5	33.5	33.5	33.5	34.5
Average of five months	34.7	34.7	34.75	34.9	35.9

REMARKS.—All kept in good condition. Slight mould in July and August, there being a little more in the open bottle.

SAMPLES KEPT IN COLD STORAGE, USING 5 C.C. CREOSOTE.

Month.	Glass.	Cork.	Wood.	Paper.	Open.
	% fat	% fat	% fat	% fat	% fat
May	33	33	32.75	32.75	33
June	31.75	32	31.75	32	31.75
July	32	32	32.5	32.5	33
August	43	43	43	43	43.5
September	33.5	33.5	33	33.5	33
Average of five months	34.65	34.7	34.60	34.75	34.85

REMARKS.—All kept in good condition. No mould.

AVERAGES OF DIFFERENT PRESERVATIVES AT DIFFERENT TEMPERATURES FOR FIVE MONTHS.

Preservative.	Place kept.	Glass.	Cork.	Wood.	Paper.	Open.
		% fat	% fat	% fat	% fat	% fat
Large amount 3:1	Cold Storage, 38° to 45°	34.5	34.55	34.4	34.35	34.6
Large amount 3:1	Ordinary Room, 60° to 85°	34.55	34.6	34.45	34.7	35.1
5 c.c. Creosote	Cold Storage, 38° to 45°.	34.65	34.7	34.6	34.75	34.85
5 c.c. Creosote	Ordinary Room, 60° to 85°	34.7	34.7	34.75	34.9	35.9

NOTE.—When using creosote as a preservative, only two-thirds of the regular amount of sulphuric acid is required in testing for fat with the Babcock test.

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Conclusions.

1. At both temperatures and with both preservatives the composite samples in open bottles tested too high. The differences were greater when the samples were kept at room temperature. Composite samples should be kept tightly stoppered. There was not much difference in the average results whether glass stoppers, cork, wood, or paper cap stoppers were used. All these may be expected to give good results.

2. The creosote proved to be a good preservative, and has the advantage of requiring less sulphuric acid for a test than the ordinary preservatives commonly used. Creosote has a very pungent odor which might be objectionable in a creamery. Formalin as a preservative tends to require a larger volume of sulphuric acid when making a test. The small amount of 3:1 potassium bichromate, mercuric bi-chloride preservative was not satisfactory as the samples, particularly in July and August, kept in the laboratory, were so badly moulded, they could not be tested. A sufficient amount of preservative must be used to prevent moulding of the sample.

New Casein-fat Milk Test.

For a number of years we have strongly advocated the consideration of both casein and milk-fat when determining the relative values of milks for Cheddar cheesemaking. Until the introduction of the Hart casein test in the United States, and of the Walker casein test in Canada, no simple method of ascertaining the casein content of milks was available. By means of the Babcock test the fat of milk can be tested, and either of the casein tests, will determine milk casein. Previous to the introduction of casein tests we had advised the addition of the factor 2, to the percentage of fat in the milk as an approximate basis for casein-fat. Our experimental work shows this to be fairly correct, but the tendency is to demand something more definite and accurate, and at the same time, with small cost and little labor.

During the past three years the Dairy Department has been working on a test which will give the combined casein-fat content of milk at one operation. We think this test is now practically complete. Some minor changes may be necessary, with further experience, but the principle we believe to be correct

Messrs. Cherry and Macdonald, undergraduates in Dairying, 1911-12, did a good deal of work on the test. Messrs. McKay and Brown, two assistants in the Dairy have also helped very much in perfecting details. We are under obligations to the Chemical Department for assistance with chemicals and in making analyses.

The test is based on the principles of precipitation of the caseous material, including the fat, by means of acid mercuric nitrate, and massing of the precipitate in a graduated bottle through the action of centrifugal force. Like all similar workers we have made free use of other men's labors. Babcock made use of the work done by a number of investigators who preceded him. Hart did the same. So do we. There is nothing new, uncommon, or unprofessional in this. It is the method of scientific workers in all branches of investigations.

In a word, the concentrated acid mercuric nitrate (made by dissolving mercury in twice its weight of nitric acid, of a specific gravity of 1.42 to which an equal bulk of water is added after solution) is diluted with thirty times its bulk of water; this is the only chemical used, the cost of which should not be over one

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dollar per liter (1,000c.c.) in concentrated form; 20 c.c. of the dilute mercuric nitrate are added to the graduated bottle, then 5 c.c. of milk, and the whole allowed to stand six to seven minutes *without shaking;* (the temperature of the milk and acid should be between 65 degrees to 70 degrees F.) the bottles are then placed in a centrifuge, fifteen inches in diameter and whirled at a speed of 2,000 revolutions per minute for seven to eight minutes. The bottles are then read in percentage as combined casein and fat. We find the results to agree quite closely with separate determinations of fat by the Babcock and casein by the Hart or Walker methods.

The advantages of the test are, a saving of time, labor and chemicals as compared with making two tests and a rapid determination of the relative value of milks for cheesemaking or for any other purpose than that of buttermaking, for which, of course, fat alone is necessary.

Respectfully submitted,

H. H. DEAN.

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PART VIII.

THE PROFESSOR OF ANIMAL HUSBANDRY.

To the President of the Ontario Agricultural College:

SIR,—I have the honor to submit herewith the report of my department for the year 1913.

IMPROVEMENTS.

The new dairy barn is now practically completed. The old dairy stable was moved and placed as a wing to the main barn and is fitted with modern equipment with calf pens and box stalls. In addition to this, a milk-house has been added to the stable, which will improve our facilities for handling milk.

A great deal of work has also been done in the way of improving the land purchased in the spring of 1912, but a good deal still remains to be done.

IMPORTATION OF STOCK.

Under instructions from the Minister of Agriculture, I visited England during the summer, for the purpose of purchasing some dairy Shorthorns for the College farm. Nine females and three bulls were imported, and reached the College early in October. One of the bulls has been sent to the Experimental Farm at Monteith, and the remainder of the importation will remain at the College.

It is too soon to say anything regarding the probable success of this importation. We think, however, that we have a good chance to develop some good milkers from the cattle which have been imported.

There seems to be a misunderstanding in some quarters regarding our object in importing these cattle, and therefore it may be well to explain that these cattle were not imported to compete with the dairy breeds in the strictly dairy sections of the Province. Those farmers who are making a specialty of dairying will, of course, adhere to the strictly dairy breeds, but we believe that there are many farmers who, owing to circumstances or to inclination, do not care to make a specialty of dairying, but who wish to get hold of cattle which will produce milk in profitable quantities, and which, at the same time, will raise calves suitable for making export beef animals. It is to such people that a dual-purpose breed, such as the dairy Shorthorn, will especially appeal, and we have already received many inquiries from farmers who would like to purchase animals of this kind from us, but of course we have nothing as yet for sale.

THE DAIRY HERD.

Below is given the record of our dairy herd from November 1st, 1912, to October 31st, 1913. Only such cows as have been in the herd during the whole of one lactation period have been included in the table.

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DAIRY HERD RECORD, NOVEMBER 1ST, 1912, TO OCTOBER 31ST, 1913.

Cows.	Age Nov. 1, 1912.	Number of days in milk.	Pounds of milk.	Per cent. of fat in milk.	Pounds of fat.	Pounds of butter, adding 1/6 to fat.
Holsteins.						
Boutsje	10	360	14,259	3.12	445.83	520.13
Abby M. Rue	2	335	12,336	2.84	351.06	409.57
Mercena N., O.A.C.	8	328	10,971	3.00	328.97	383.79
Beauty, O.A.C	8	267	10,110	2.76	279.21	325.79
Molly de Kol	11	314	9,887	3.23	319.29	372.50
Toitilla Rue	3	281	9,253	3.15	292.17	340.86
Beauty, O.A.C. 3rd	3	285	9,077	2.92	265.01	309.17
Margaret C	7	311	9,069	3.26	296.01	345.34
Mercena N., O.A.C, 2nd	2	305	8,863	3,33	295.07	344.24
Toitilla	11	314	8,671	3.43	297.34	346.89
Molly Rue	4	351	8,594	3.70	318.30	371.93
Toitilla Rue 2nd	2	336	8,383	3.64	305.83	356.80
Molly Rue 2nd	2	339	7,126	3.36	240.25	280.29
Ayrshires.						
Bud 2nd	10	272	8,083	3.75	303.34	353.89
Tibby F	7	347	7,997	3.98	318.27	371.31
May Queen, O.A.C	4	346	6,815	3.45	235.04	274.21
Floss 5th	8	211	6,335	3.85	244.22	284.22
Minnie, O.A.C	4	291	6,077	3.74	227.31	265.19
Tibby F. 2nd	2	277	6,005	3.80	228.71	266.82
Rose 3rd	8	217	5,660	3.70	209.46	244.37
White Rose	2	277	5,469	3.80	207.83	242.46
Lady Nancie 2nd	12	229	4,417	4.63	204.66	238.77
Jersey.						
Dreamy, O.A.C	2	330	4,169	6.19	258.25	301.29
Grades.						
Blackie	10	343	12,658	3.23	409.51	477.76
Springwood	4	357	11,466	2.96	340.43	397.16
No. 166	3	303	8,841	3.25	287.96	339.95
Blend	3	342	8,450	3.83	326.04	380.38

EXPERIMENTS WITH SWINE.

SUPPLEMENTAL FEEDS FOR YOUNG PIGS.

OBJECT OF EXPERIMENT. The greatest difficulty in feeding young pigs after weaning is to get feeds which are palatable, and which tend to promote growth and thrift. Skim-milk is one of the very best supplemental feeds at this period of the young pig's life, but frequently it is not available and the feeders must look for something to take its place.

It is a well established fact that young pigs require feed rich in protein, or muscle and blood-forming material, otherwise they will not make satisfactory growth. The Harris Abattoir Co., and the Wm. Davies Co., both of Toronto, have each put upon the market a by-product of their slaughter-houses, known as tankage, a product rich in protein, and also in ash, or bone-forming material. The primary object of the tests described below was to compare these products with skim-milk as a supplemental feed for young pigs.

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PLAN OF EXPERIMENT. Twenty-one young pigs were divided into four groups, as follows:

Group 1—6 pigs, meal only.

Group 2—6 pigs, meal and skim-milk fed in proportion of about 1 lb. of meal to 1½ lbs. of milk.

Group 3—6 pigs, meal and Harris tankage, fed in proportion of 6 lbs. of meal to 1 lb. of tankage.

Group 4—3 pigs, meal and Davies tankage, fed in proportion of about 5½ lbs. of meal to 1 lb. of tankage.

A slightly larger proportion of Davies tankage was used than of Harris tankage, for the reason that the Davies tankage cost somewhat less per ton, and, according to guarantee, contained slightly less protein.

The meal ration was as follows:

Four weeks, middlings alone.

Four weeks, 3 parts middlings to 1 part barley.

Five weeks, 2 parts middlings to 1 part barley.

RESULTS. The following table shows weights, gains, and feed consumed during the 91 days of the test:

TABLE SHOWING WEIGHTS, GAINS AND FEED CONSUMED.

	Group I.	Group II.	Group III.	Group IV.
	Meal only, 6 pigs.	Meal and skim milk, 6 pigs.	Meal and Harris Tankage. 6 pigs.	Meal and Davies Tankage, 3 pigs.
	Lbs.	Lbs.	Lbs.	Lbs.
Weight of pigs June 19.....	285	187	269	125
" September 18....	692	696	827	403
Gain in 91 days.....	407	509	558	278
Average gain per pig per day....	0.74	0.93	1.02	1.01
Meal consumed	1735.	1571.	1650.	831.
Supplemental feed consumed	0	2436. (milk)	274 (tankage)	155 (tankage)
Meal consumed per 100 lbs. gain.	426.2	308.6	295.7	298.9
Supplemental feeds consumed per 100 lbs. gain.....	0	478.6 (milk)	49.1 (tankage)	55.7 (tankage)

Average weight of pigs at commencement..... 41 lbs.
" " close . . . . 124 lbs.

It will be noted that Group I was fed meal only, and, therefore, serves as a check group, giving a basis of comparison.

According to the results of this test, the meal values of the supplemental feeds used were as follows:

(1) 100 lbs. meal proved equal to 406.9 lbs. of skim-milk.

(2) 100 lbs. meal proved equal to 37.6 lbs. of Harris tankage.

(3) 100 lbs. meal proved equal to 48.5 lbs. of Davies tankage.

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Conclusions.

1. All the supplemental feeds had a marked influence in increasing the gains and improving the thrift of the pigs.

2. If the meal is valued at $22.00 per ton, the skim-milk used in this test showed a value of 27c. per 100 lbs., Harris tankage a value of $2.92 per 100 lbs., and Davies tankage a value of $2.27 per 100 lbs.

3. In this test it proved economical to use high priced feeds, rich in protein, such as tankage, to supplement the meal ration.

4. High priced concentrated feeds such as tankage, must be used in very small quantities in order to be economical.

5. It must be borne in mind that this is only a single test, and it will require further tests to verify the results.

Supplemental Feeds for Finishing Hogs.

Object of Experiment. In the test previously described, it was found that it was economical to use small amounts of high-priced feeds which were rich in protein, to supplement the meal ration of young, growing pigs, but we wished to test whether it was profitable to use such feeds in the case of well-grown, thrifty hogs put into pens for finishing.

Plan of Experiment. Sixteen hogs, which had been on pasture, and which were in hearty, vigorous condition, were divided into four groups.

Group 1—Was fed meal only.

Group 2—Meal and skim-milk.

Group 3—Meal and Harris tankage.

Group 4—Meal and Davies tankage.

The proportion of meal to tankage was the same as in the previous test, but owing to difficulty in securing skim milk, we had to use a very limited amount and, therefore, the skim milk group can scarcely be called satisfactory, though it is included in the statement.

The meal consisted of equal parts by weight of ground barley and middlings.

Results. The following table shows the weight, gains, and feed consumed by the hogs in this test:

Table Showing Weights, Gains and Feed Consumed.

	Group I.	Group II.	Group III.	Group IV.
	Meal only, 4 pigs.	Meal and milk. 4 pigs.	Meal and Harris Tankage. 4 pigs.	Meal and Davies' Tankage, 4 pigs.
	Lbs.	Lbs.	Lbs.	Lbs.
Weight of pigs Oct. 10	571	623	665	631
Weight of pigs Nov. 7	762	837	869	831
Gain in 28 days	191	214	204	200
Average gain per pig per day	1.70	1.91	1.82	1.78
Meal consumed	712.	732.	655.	662.
Supplemental feed consumed	0	672 (milk)	109 (tankage)	123 (tankage)
Meal consumed per 100 lbs. gain.	372.7	342.	321.	331
Supplemental feed consumed per 100 lbs. gain	0	314. (milk)	53.8 (tankage)	61.5 (tankage)

Average weight of hogs at commencement..... 156 lbs.
" " close . . . . 206 lbs.

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NOTES.

1. All the hogs made very satisfactory gains.

2. One hundred pounds of meal proved equal to 1,022.8 pounds of skim-milk, which is less than half the value for skim-milk shown in the test with young pigs.

3. The tankage showed no influence whatever so far as reducing the amount of meal per 100 lbs. of gain is concerned, so that it proved unprofitable to use tankage with this lot of pigs.

4. The test would indicate that it is not profitable to feed tankage to thrifty, well-grown hogs during the finishing period.

5. As noted before, this is only a single test and must not be taken as entirely conclusive, although the results are pretty much in harmony with practical experience and with the findings of other investigators.

Respectfully submitted,
G. E. DAY.

PART IX.

THE PROFESSOR OF POMOLOGY.

To the President of the Ontario Agricultural College:

SIR,—I beg to present herewith report of the Department of Pomology, for 1913.

The teaching and instruction work of this Department has been conducted along the usual lines. We are pleased to note an increased interest in fruit and vegetable work and an increasing demand for instruction. On account of lack of facilities we are almost entirely prevented from giving instruction by means of practical work and demonstrations. The nature of the subject renders it almost impossible to do efficient teaching without demonstrations and practical work.

A Short Course in Fruit Growing and a School of Box and Barrel Packing were well attended. Our thanks are due the Fruit Branch of the Department of Agriculture for the services of Mr. W. F. Kydd and Mr. Leslie Smith, who acted as instructors in packing.

A small commercial orchard was planted last spring on the land acquired last year. Additional plantings will be made.

The fruit crop in the College orchard was exceptionally good. The crop of apples was the largest ever harvested.

Strawberries and black currants were seriously injured by frost. Red currants and gooseberries produced excellent crops.

PLANT BREEDING.

Mr. H. S. Fry, an undergraduate, accomplished excellent work throughout the summer season as assistant in fruit work. A large part of Mr. Fry's time was this season devoted to hybridizing and plant breeding work, and as a result we have over 16,000 strawberry seedlings in 2½ inch pots ready to go to the field in the spring. We also have a considerable number of apple, pear, currant and gooseberry seedlings to be carried on to fruiting.

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UNDERDRAINAGE.

With the co-operation of the Department of Physics, we have this fall thoroughly underdrained the twenty acre field which up to the present has contained all of our fruit plantations and a considerable quantity of vegetable crops. The expenditure involved has been somewhat heavy, owing to the necessity of putting down a 14 inch outlet some 2,000 feet in length; but the completed work will greatly improve the land in question for fruit growing purposes.

NEEDS.

The principal needs of this department are improved facilities for instruction work. As stated above, practically all instruction is given in the form of lectures. We require space for the practical teaching and *demonstration* of such matters as the preparation of spraying materials; grafting and other propagation work; grading and packing of fruits; use of tools and implements; seed testing and the sowing of seeds, etc.

VEGETABLES.

Mr. A. H. MacLennan reports as follows on the vegetable work for the year:—

For report of experiments in control of Celery Blight, see the report of the Department of Botany. For report of experiments with fertilizers for vegetables, see the report of the Department of Chemistry.

Considerable work in hybridizing is going forward with tomatoes and cucumbers. In tomatoes, it is desired to combine the good qualities of such varieties as Clipper, Industry, Bonny Best and Grand Rapids.

The installation of the Skinner Irrigation Plant, four acres in extent, is now complete and our vegetable garden is now safe from drought. The cost of piping and the labor of erecting same was approximately $100 per acre.

The following are notes on new and valuable varieties which have not previously been reported on.

Tomato: Three years ago we secured seed of two excellent varieties originated by Mr. A. McInnis, London, Ont. Both are varieties suitable for second early market or for canning purposes, being of the same season as Chalk's Jewel. "Red 14" is a potato-leaved red tomato and a heavy cropper. "Red Canner" is somewhat of the type of Chalk's Jewel, but is larger, more productive and of better quality.

Beans: "Carter's Magpie"—roundish wax pod, very productive, almost free from disease, extra early. "California Black"—flat wax pod, earlier than Magpie, and more productive. Little troubled by disease.

Cabbage: Tall-stemmed Danish Ballhead—a round, late variety of excellent keeping qualities.

Respectfully submitted,

J. W. CROW.

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PART X.

THE PROFESSOR OF LANDSCAPE GARDENING.

To the President of the Ontario Agricultural College:

SIR,—I have the honor to present herewith a brief report upon the work of the Department of Landscape Gardening for the year 1913.

The aim of this department is to cultivate a taste for good landscape art, to foster the general movement for rural and civic improvement, and to assist in any way possible those who are working for a better and more beautiful Canada. Our efforts have been through lectures to our students as provided for in the curriculum; through outside lectures to various organizations throughout the country; through co-operation with our District Representatives and School Inspectors and by advice and assistance to School Boards interested in the improvement of school grounds. We are pleased to be able to report progress, a more satisfactory progress, we believe, than ever before, because there is a steadily growing interest in such work.

OUTSIDE LECTURES.

Lectures, most of which were illustrated by means of the stereopticon, were given as follows: To Horticultural Societies at Toronto, Hamilton, Paris, Smith's Falls, Perth, Chesterville, London, Grimsby, Dundalk, St. Thomas and Calgary. To Boards of Trade at Hamilton and North Bay. To Teachers' Conventions at Aylmer, Guelph and St. Thomas. To schools at Blenheim, Bright and Sparta. To Farmers' and Women's Institute meetings at Mount Forest, Sparta and Goderich.

IMPROVEMENT OF SCHOOL GROUNDS.

For several years we have been carrying on a steady campaign for the general improvement of school grounds, believing they should be made neat, attractive public and social centres, which would have a wholesome, uplifting influence on the homes of the community in which they are located. Through the co-operation of some of the School Inspectors and District Representatives, I have been able to visit a large number of schools, meet the trustees and advise them regarding improvement of their school surroundings.

In the Township of North Dumfries in Waterloo County, we visited all of the ten schools, and have arranged to prepare for them planting plans showing how the grounds at each school may be developed to the best advantage. In a similar way, in company with the District Representative and the School Inspectors, we visited most of the schools in Oxford County, and look forward in due time to a marked improvement of the schools of these counties.

Upon request, the schools were also visited at Agincourt, Georgetown, Burlington, Clifford, Mount Forest, Napanee, Belleville, Waterloo, Tillsonburg, Sparta and North Bay, and the School Boards advised regarding the improvement of the grounds at these places. In most cases surveys were obtained and planting plans will be prepared this winter, that the work may be carried out systematically to a completion.

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Care of Campus.

The ornamental grounds about the College and Macdonald Institute, which are under the charge of this department, have always been a pleasure and inspiration to our students and many visitors. This year they have been more or less upset by the building operations and the tearing up of drains and heating pipes in various parts of the grounds.

A new perennial border has been laid out south of the greenhouse, and a system of sub-irrigation has been installed that should enable us to ascertain the value of this system for watering a lawn and flower garden.

Advantage was taken of the exceptionally fine weather this autumn to move and transplant a number of large trees and shrubs. The subsequent growth of large specimens so moved is seldom as satisfactory as with younger plants, but is sometimes necessary. We have a large number of thrifty young shrubs that have now had two seasons' growth in our own nursery. These can now be transplanted whenever needed and many of them will be used next spring to give a more finished appearance to the grounds about the new buildings or old ones that have been moved.

Floriculture.

Mr. Wm. Hunt, Lecturer in Floriculture in this department, has in addition to his regular College duties rendered valuable service as lecturer at a number of horticultural meetings, and judge at a number of horticultural exhibitions. He contributes the following notes on new and interesting plants that have been tested the past season:—

Hardy Border Plants.

Centaurea Cyanus flore pleno. Annual. Height 3 feet. This double, free flowering type of the cornflower, recently introduced, will be found very useful for decorative purposes, either as a border plant or for cut flower purposes. By sowing seed indoors early in April, and planting outside about the end of May, its showy peacock blue, or pure white flowers can be had from early in July until November. The white flowering type of this plant should prove a useful florist's flower for summer cuttings. Both of these types have been listed in Canadian seed catalogues for the past season or two.

Red Sunflower. Annual. This is a decided novelty. A large percentage of the flowers are of a rich, bronzy-red color, in others there is a circle of gold color at base of petals, as well as on the margin of the petals, giving them a strikingly beautiful appearance. Flowers 6 to 8 inches in diameter. Height of plant four to five feet. A vase of these flowers exhibited at the Guelph Horticultural Show was much admired. Seed secured from Sutton and Sons, Reading, England.

Sutton's Brilliant Rose Petunia. Height 12 inches. One of the new dwarf, compact, small flowering types of Petunias, recently introduced. Very profuse flowering habit. There are several colors, white, violet and white, striped and blotched rose and white. The rose colored types are probably the best. A very useful bedding plant. The old plants cut back, dug up and potted before hard frosts, make splendid pot plants that will flower all winter in a sunny window.

Chrysanthemum Arcticum (Artic Daisy). A very showy, conspicuous hardy perennial. The plant grows to about three feet in height, of a bushy balloon

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shaped habit. It is literally covered with its white Oxeye-daisy-like flowers, from about the middle of September until quite severe frosts. Henry A. Dreer, Philadelphia, Pa., re-introduced this plant in 1912, it having been apparently lost sight of for some years. It is a native of Arctic Alaska. No perennial border should be without a plant or two of this showy, autumn flower plant. A plant purchased from the above named firm was quite conspicuous and an object of great interest during the past autumn in the College border. Useful for cut flowers.

Pentstemon gracilis. Perennial. Height 12 to 18 inches. A very free flowering dwarf type of the Pentstemon digitalis type.

Salvia globosa. Perennial. Height 18 inches. The silvery-grey foliage of this salvia with its profusion of small white flowers, makes it a noticeable object in the perennial border, from early summer until autumn. It appears to be quite hardy, having stood two winters without protection. The plants were raised from seed sent out by Thorburn and Co., New York, in 1911.

Greenhouse and Window Plants.

Calceolaria profusa (Clibranii). A new hybrid type of the greenhouse herbaceous calceolaria. Much easier of culture than the old grandiflora type. The flowers are borne in large, loose, and gracefully formed sprays that give the plant a very attractive appearance. A decided acquisition to this class of plants.

Calceolaria "Buttercup." A hybrid herbaceous greenhouse type of easy culture. Very profuse in flowering habit. Flowers a soft golden yellow, dotted with pale brown spots. Larger flowers than Clibranii, and the flowering stems are of sturdier growth. Both of these fine Calceolarias were sent out by Veitch and Sons, Chelsea, England, in 1912.

The following new Chrysanthemums sent out by Elmer D. Smith and Co., Adrian, Michigan, U.S.A., 1913, and tested among other new kinds at the College, have points of special merit to recommend them.

Allegheny. Single. A pale pink, resembles the well known variety "Ladysmith." The individual flowers are larger, the plant is not of as good a habit of growth as the last named for a pot plant.

Blazing Star. Single, petals slightly incurving. Color a new and pleasing, rather dull shade of lake crimson. Calyx in centre showing a golden yellow, making it very noticeable. The formation and color of its flowers are quite new and unique, something like an incurved single dahlia.

Celtic. Flowers large, 4½ inches in diameter, of a beautiful silvery rose pink shade. Base of petals closely quilled and almost white in color, giving the flowers a very attractive appearance. Free flowering, pretty and unique.

Golden Robin. Double. Bright golden yellow, slightly recurve bloom. Free flowering, medium height, will make a good variety for pot culture.

Laurita. Single. A splendid addition to the quilled anemone, Japanese section. The peculiar ray-like formation of its bright yellow flowers produced in profusion, will make it a valuable acquisition for cut flower purposes.

Lucille Quinlan. Double. A broad petalled, loosely incurved bloom of a rich primrose yellow. Promises well for either bench or pot culture.

Mary E. Meyer. Double. A Japanese pure white recurve of the Christy Matthewson type, not as tall growing as the latter, flowers not quite as large. Sturdy, short jointed growth, well furnished with foliage. A good keeper, will likely prove a useful variety.

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White Perfection. Double. A high, well rounded incurve and quite double. An improvement of the Pres. Roosevelt, Pres. Taft, Naomah and Miss Faith Moore varieties, although possibly not quite as intensely pure white as most of the last named. Form of flower and habit of growth as near perfect as possible. Should be in every collection.

GERANIUMS.

Ten or twelve new varieties introduced by Henry A. Dreer, of Philadelphia, Pa., were tested during the past season, several of which will likely take a permanent place among the standard varieties now grown.

Agathos. Semi-double. Very similar in habit of growth and flowering to the well known bedding variety, A. Ricard, color of flower a few shades darker scarlet. Promising as a bedding variety.

Baronne de Longueuil. Semi-double. This variety might almost be classed as single flowering, as only a few short, imperfect petals were produced in the centre of some of the flowers. It bears very large trusses of a peculiar shade of magenta-rose, the petals being stencilled almost pure white. Good strong grower. A showy, unique variety.

Marquis d'Abadie. Semi-double. Magnificent foliage and habit. Very large truss of rosy-salmon pink flowers edged with white. Resembles somewhat the well known Mme. Jaulin (Apple Blossom) variety. Pretty, likely to be very popular.

Mme. Paola Radaelli. Semi-double. Very compact habit of growth. Flowers peculiar in color, often showing alternate florets of pale pink and white on the very large trusses it bears, the white florets dominating in point of color, giving the flower a creamy white appearance generally. Should prove a good bedding variety.

Charles Guerin. Single. The individual flowers of this variety are very large and of a pale, pleasing salmon carmine shade. Fair grower, pretty.

Diamant. Single. A pretty, dwarf growing variety, flowers white, slightly margined with carmine. Free flowering, odd, very noticeable in a collection.

Frederick Plessis. Single. This is a promising variety. The immense trusses of rosy-carmine flowers with white eye, make it very pleasing and conspicuous. Good, robust habit of growth. Very promising as a bedding or pot plant.

Kleios. Single. Of rather dwarf growth. Flowers a dark, brilliant crimson, shading to almost violet, with small white eye. Not very free flowering. Distinct, will possibly prove a good variety for pot culture.

Pierre Valdague. Single. Good grower. Large truss, and florets of a peculiar shade of carmine-crimson. Will likely prove to be a good bedding variety.

Saccha Guitry. Single. Strong, vigorous grower, large trusses of vivid scarlet orange flowers. A very striking conspicuous variety.

Respectfully submitted,

H. L. HUTT.

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PART XI.

THE PROFESSOR OF POULTRY HUSBANDRY.

To the President of the Ontario Agricultural College:

SIR,—I have the honor to present herewith the report of the Poultry Department for the year 1913.

The usual courses of lectures have been given to regular college students and to the short courses. The lectures to teachers in attendance during the summer have increased and moreover the practical work given in these courses takes considerable time and material. The lectures and practical work of students has gradually increased each year until the present class-room, etc., has become entirely inadequate.

The outside work has increased each year. Mr. Marcellus is kept busy for nearly eight months of the year giving lectures, judging, and demonstrating at outside points and there are times when three and four men are busy along these lines.

NEW BUILDINGS.

There is now, in the course of construction, a new administration building, sixty-three feet by one hundred feet. The building is of two stories and a basement. This will permit us to do much better work for the students, the old building being entirely too small, so much so that we were obliged this season to use chairs in the aisle of the class-room and also to seat students on the lecture platform. We have never had sufficient room to give the students any reasonable work in judging poultry, candling eggs, etc. The new building will give ample room for all classes and demonstrations.

The poultry plant in general has grown gradually, year by year. Probably no person, fourteen years ago, had any idea that in such a period of time the breeding of mature stock would increase ten times to what it was then, and furthermore the young stock grown has increased, even greater. The general result of such growth has been that nearly everything was more or less unhandy and to a certain degree expensive to operate.

The construction of the new administration building has necessitated the moving of some houses, and more will be required to be moved upon the completion of the building.

The breeding work has necessitated the addition of over forty pens to the general plant.

Much work in the moving of buildings and the general overhauling of the plant remains to be done next year.

EXPERIMENTAL WORK.

A general farm poultry bulletin is now being printed which deals with the experimental work along nearly all lines, hence a detailed report is not required here.

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Breeding Work.

The average farmer and student is getting interested in poultry and particularly in the breeding of hens for egg production. There appears to be a general impression, at least among some, that we are breeding a class of birds all of which are laying 200 eggs or more per year. This we have not done, nor is it at all likely to be accomplished in the near future, if ever. Our aim has been to develop an early maturing, general purpose bird, that would lay three to four dozen eggs each during the winter months as well as a fair number of eggs in summer, and at the same time have a bird large enough to meet the market demands in dressed poultry. Practically speaking this means that a cockerel hatched during April or May will weigh six or seven pounds from September to November and whose sisters will commence laying during October and November.

We are to a limited extent trying to study how different characters are inherited, but more particularly how to breed a good chicken for the farmer.

During the past season nearly 17,000 eggs of one breed were distributed to rural school children. This gets the boys and girls interested in live stock and is a step towards the production of a uniform product. Each season has been one of a steady increase in demand for birds and eggs by the farmers. We hear less of the scrub hen and more of the pure breeds and first crosses.

Hatching and Rearing.

Eggs hatched moderately well this year, and the general season of rearing was fairly good. Each year it becomes more evident that where one is raising a number of chickens they do best when well distributed over a large area of land and, if possible, on land that is new to poultry.

Where more than five hundred chickens per acre are well grown, it requires a heavy expenditure of time and money to keep the birds healthy and growing; one half the number grown along with a crop such as corn or potatoes usually means cheaper and better birds.

The growing of early spring broilers is an art, and our experience is that when birds have to be confined to the buildings for several weeks at a time, or to very small yards, that the feeding of all hard grains is not a good practice. We have had much better results by feeding a little hard or dry grains in the litter to induce the birds to exercise, and then feeding the main ration of cooked vegetables dried off with meal. An abundance of succulent green food is also necessary.

The general management and feeding is discussed in the bulletin now on the press and is therefore unnecessary here.

In conclusion, my thanks are due to the various departments which have assisted in many ways and to the faithful and efficient work of those associated with me in this Department.

Respectfully submitted,

W. R. GRAHAM.

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PART XII.

THE PROFESSOR OF BACTERIOLOGY.

To the President of the Ontario Agricultural College:

SIR,—I have the honor to submit the following report upon the work of the Department of Bacteriology during the year ending Nov. 30th, 1913.

Lectures, demonstrations and laboratory work were given to the regular course students at the College and Macdonald Institute, to the short course students in Dairying and Poultry Husbandry, to the Western Ontario Dairy Instructors, and to the Normal School and Summer School students, as outlined in the courses of instruction for these various groups.

For the first time, lectures were given to the regular third year students of the College during the fall term, which course will supersede that heretofore given the senior agriculture option men. Under this plan the work is more closely linked to that of the second year, and better prepares the men for the work of the senior year.

During the year the large room previously occupied by the Department of Field Husbandry as an agricultural museum was vacated by that department, and with funds supplied from the Dominion grant, alterations were made giving us increased laboratory and lecture room accommodation. These changes afford us a well lighted lecture room, seating 126 persons; a laboratory with ample desk and locker room for 30, a smaller laboratory for advanced students accommodating 10, an assistant's laboratory, two large incubator rooms, a sterilizing room, and a library. Increased room has been greatly needed for a number of years and is greatly appreciated.

WORK IN SEED INOCULATION.

A total of 3,154 cultures of legume bacteria, each culture sufficient for one bushel of seed, were distributed for various seeds as follows:

Alfalfa, 2,446; Red Clover, 461; Alsike Clover, white clover, peas, beans, vetches, sweat peas, soy bean, cow peas, 247.

The number of cultures sent shows a marked decrease from last year the cause for which we attribute very largely to the difficulty which farmers encountered last season in securing alfalfa seed. The distribution of alfalfa cultures by Provinces is as follows:

Ontario, 1,696; Alberta, 131; British Columbia, 240; Saskatchewan, 168; other provinces and foreign countries, 211. It is of interest to note in this connection that several cultures were sent to South Africa, Egypt and to Formosa. The total number of farmers to whom cultures were sent was 1,493, of whom 1,267 received cultures for alfalfa. As heretofore, blank reports were sent to recipients of cultures asking for the results of their seed inoculation, and data compiled from the reports returned show the inoculation beneficial to the crop in 68.3 per cent. of cases.

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Extension.

As last year, a considerable amount of material for exhibition purposes was prepared for the Better Farming demonstration train, for the Canadian National Exhibition, and for the District Representatives of the Department of Agriculture. This included specimens of plant and animal diseases, various cultures of milk, soil, and pathogenic organisms, photographs, lantern slides, etc. Much of the work seems almost too trivial to mention, yet the securing and preparation of the material consumes a good deal of time.

Varied specimens sent into the laboratory for examination were as follows:

Abortion: Infectious, 2.
Anthrax: 1 positive, 1 negative.
Ants: For pear blight organisms, 2 negative.
Apple twigs: Fire blight, 2 negative.
Bee: For pear blight infection, negative.
Cat: Suspected tuberculosis, negative.
Canary: No infection.
Celery: Bacterial soft rot.
Cock: Healthy.
Cockerel: Probable poisoning.
Cockerel: Ruptured artery.
Cows: Tuberculosis, 7.
Diphtheria: 1 positive, 1 negative.
Gonococcus: 5 specimens, negative.
Heifer: Lungs, suspected tuberculosis, negative.
Hens: Suspected tuberculosis, 11 positive, 1 negative.
Hens: Fatty necrosis of liver, 4.
Hens: Ovaritis, 5.
Hen: Tumor on kidney, 1.
Hen: Blackhead, 1.
Hens: Suspected infection, found healthy, 5.
Horse: Blood, no infection found.
Hog: No infection.
Milk: Red and bitter, 1.
Milk: Bacterial count, 6.
Milk: Spoiled evaporated, 7 cans, source of trouble found to be factory water supply.
Peas: Root rot, 1.
Pig: Hog cholera, 1.
Potato: Bacterial rot, 1.
Pullet: Ruptured artery, 1.
Pus: Cow's udder, streptococcus infection, 1.
Turnips: Bacterial soft rot, 1.
Turkeys: Blackhead, 4.
Water: Sample condemned as unfit for use, 8.
Water: Samples passed, 8.

Fifty-eight pure cultures of lactic acid bacteria were distributed to factories for butter and cheese making.

Research.

As time from other duties permitted, the laboratory staff have engaged in investigation along various lines. For some time Mr. Jones has been making a study of several species of Azotobacter, a group of soil organisms active in accumulating atmospheric nitrogen. His results were published under the title, "A Morphological and Cultural Study of Some Azotobacter," in the Centralblatt für Bakteriologie, II Abt. 38 Band. 1913, and in the Proceedings of the Royal Society of Canada, 1913. He is pursuing further studies with these organisms, and also in plant pathology.

Mr. Lund is carrying on investigation along the line of pure milk production.

The writer secured further data on some organisms active in producing off-flavored cheese in Ontario, which, with previous results along this line, were published under the title "Fruity or Sweet Flavor in Cheddar Cheese," in the Centralblatt für Bakteriologie, II Abt. 39 Band, 1913. This work was also published as a leaflet from the Dairy Branch, Ontario Department of Agriculture.

Some preliminary work was done during the summer on the bacteria and other micro-organisms of eggs. Further work along this line is planned.

In conclusion, I would express my appreciation of the loyalty and efficient co-operation of the other members of the laboratory staff in contributing to such success as the department has met during the year.

Respectfully submitted,

S. F. EDWARDS.

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Sheaves of O. A. C. No. 21 Barley, O. A. C. No. 72 Oats, O. A. C. No. 3 Oats, O. A. C. No. 61 Rye, etc., used for ornamenting the wall over three large entrance doors.
(Space 14 feet high x 45 feet long.)

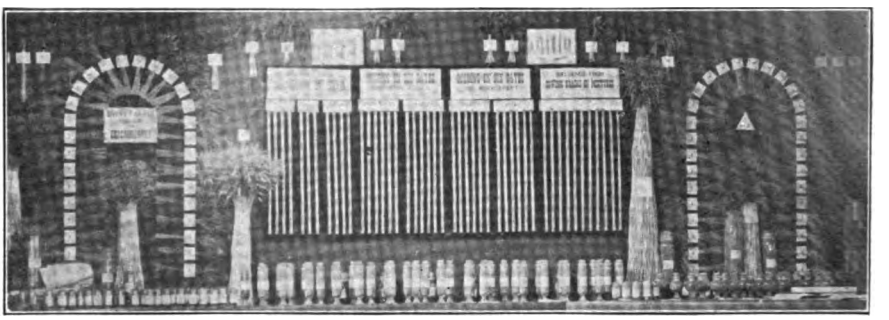

Exhibit illustrating results of Dates of Seeding, Selection of Seed, Mixtures of Grain, Leading varieties of Farm Crops, etc.
(Space 7 feet high x 27 feet long.)

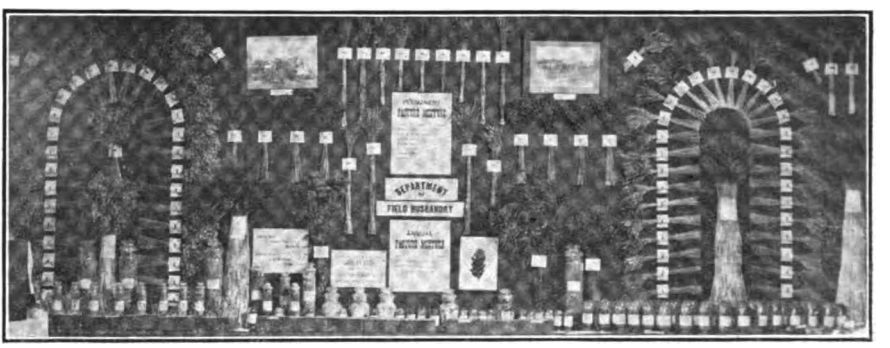

Exhibit showing varieties of Grasses and Clovers for Permanent Pasture, Varieties of Crops for Annual Pasture, Alfalfa seed plant, Mangel seed plant, best varieties of Millets, Cereals, etc.
(Space 7 feet high x 27 feet long.)

No. 1.—Views of different sections of the Exhibit of the Department of Field Husbandry, as arranged at the Canadian National Exhibition, Toronto, in the autumn of 1913.

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PART XIII.

THE PROFESSOR OF FIELD HUSBANDRY AND DIRECTOR OF FIELD EXPERIMENTS.

To the *President of the Ontario Agricultural College*:

SIR,—It is my pleasure to present the results of the work done in the Department of Field Husbandry for the year 1913. I am pleased to state that the work of the past year has been of a progressive character, and the results should prove of special value to the farmers of the Province. The College classes have been large, and the students have taken a deep interest in the work both in the class room and in the experimental plots. The experimental work has been conducted in an extensive way, and great care has been taken in the details of the work throughout. The co-operative work with farm crops has again been conducted throughout Ontario in the usual way, but has been broadened along some lines, and we believe that this work has had a very wholesome influence throughout the Province. There were probably 15,000 farmers who visited the experimental grounds in the summer, and to whom the work was explained and some of the most important results of the experiments were mentioned. These trips to the experimental grounds give an opening for discussion of many of the problems in connection with Field Husbandry at a time and in a way that seems very opportune. The correspondence during the year has been very heavy, and although this adds much work to the Department, it is pleasing to know that so much interest is taken throughout the breadth and length of our country on some of the deeper problems of agriculture, and that the farmers of the Province have confidence that we are in a position to answer their numerous enquiries. We endeavor to do our best in answering the very large number of questions which we receive. In addition to the work at the College this Department is called upon very frequently to give addresses at various agricultural meetings and conventions, to judge at practically all the leading exhibitions of the Province, and this year we have placed extensive exhibits at both the Canadian National Exhibition at Toronto, and the Provincial Winter Fair at Guelph. At the Canadian National Exhibition, not only did the Department of Field Husbandry instal an exhibit, but it had the direct charge of the arrangement of the entire College exhibit, including ten district departments and which occupied a floor space of over two thousand feet. We believe that these various activities are all having an influence in the betterment of the Field Husbandry work through the Province of Ontario.

The College lectures in Field Husbandry are confined almost entirely to Mr. W. J. Squirrell, B.S.A., and myself. The other members of the staff of the Department of Field Husbandry are not, therefore, included in the list of the Faculty of instruction of the College, but their time is devoted to experimental work and work of investigation. We have in connection with this scientific work three graduates of the College, Mr. A. W. Mason, the assistant in the Department of Field Husbandry, and Mr. C. R. Klinck and Mr. W. Southworth who devote their time almost entirely to the work of plant breeding. These men have all taken a deep interest in the work of the Department and their labors have been very efficient.

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The New Field Husbandry Building.

The new building erected for the Department of Field Husbandry of the Ontario Agricultural College by the Public Works Department of Ontario, with money received from the Federal grant, has just been completed. It is a beautiful structure, and one very suitable for the purpose for which it is built, and it is a fine acquisition to the buildings on the College campus.

The building is one hundred and forty-six feet long and sixty-four feet wide and consists of two storeys in addition to the basement and the attic. The walls of the basement are of dressed stone, and those of the two upper floors are of red brick, the upper portion of which is covered with stucco, and the roof has a deep projection and is made of red asbestos shingles.

The building is well lighted and is heated by steam brought under-ground from the central College plant.

The interior of the building is finished in clear native pine, and the floors are of selected maple and birch. There is an electric freight elevator running from the basement to the attic. There are three vaults, one in the basement and one in each of the two main floors. The main class-room is seated for one hundred and twenty, and the Short Course class-room will furnish seating and table accommodation for three hundred students. There is a students' laboratory twenty-six feet wide by sixty feet long for the study of farm crops and farm seeds, and an agricultural museum thirty-four by sixty feet for the presentation of some of the most important results of the College experiments in Field Husbandry. The remainder of the two main floors is taken up with offices, work rooms, investigation rooms, etc. The basement has a cement floor, and is divided into rooms for sorting grains, and for storing seeds and plants; and the attic has a good floor, is well lighted, and can be used for the purpose of preparing material for exhibitions, and for other lines of work.

The Field Husbandry building has two entrances on the side facing the street which runs in front of the Main College Residence, and one entrance on the side which faces the Brock Road, and from the general appearance of the building it is difficult to determine which is the front and which is the rear. The building has been surrounded by cement side-walks and gravelled roads and presents a beautiful appearance amongst the maple, the elm, and the evergreen trees, on the College campus.

Equipment for Work.

Probably few people realize the essential differences in the required equipment of a well furnished agricultural college in comparison with that of a college or university. All colleges require class-rooms, laboratories, libraries and museums, but in addition to these the agricultural colleges require fields and barns, green houses and stables, growing plants and living animals. While this is true of the colleges as a whole, it is particularly true of a Department such as the one of which I have charge. The work of this Department deals with the farmers and the farming operations of Ontario as well as with the students who come to the department for special training in the work of field husbandry. With the completion of the new building for field husbandry, we are in a decidedly better position than ever before for successfully carrying on the inside work of the department. With an addition to our experimental grounds, part of which was

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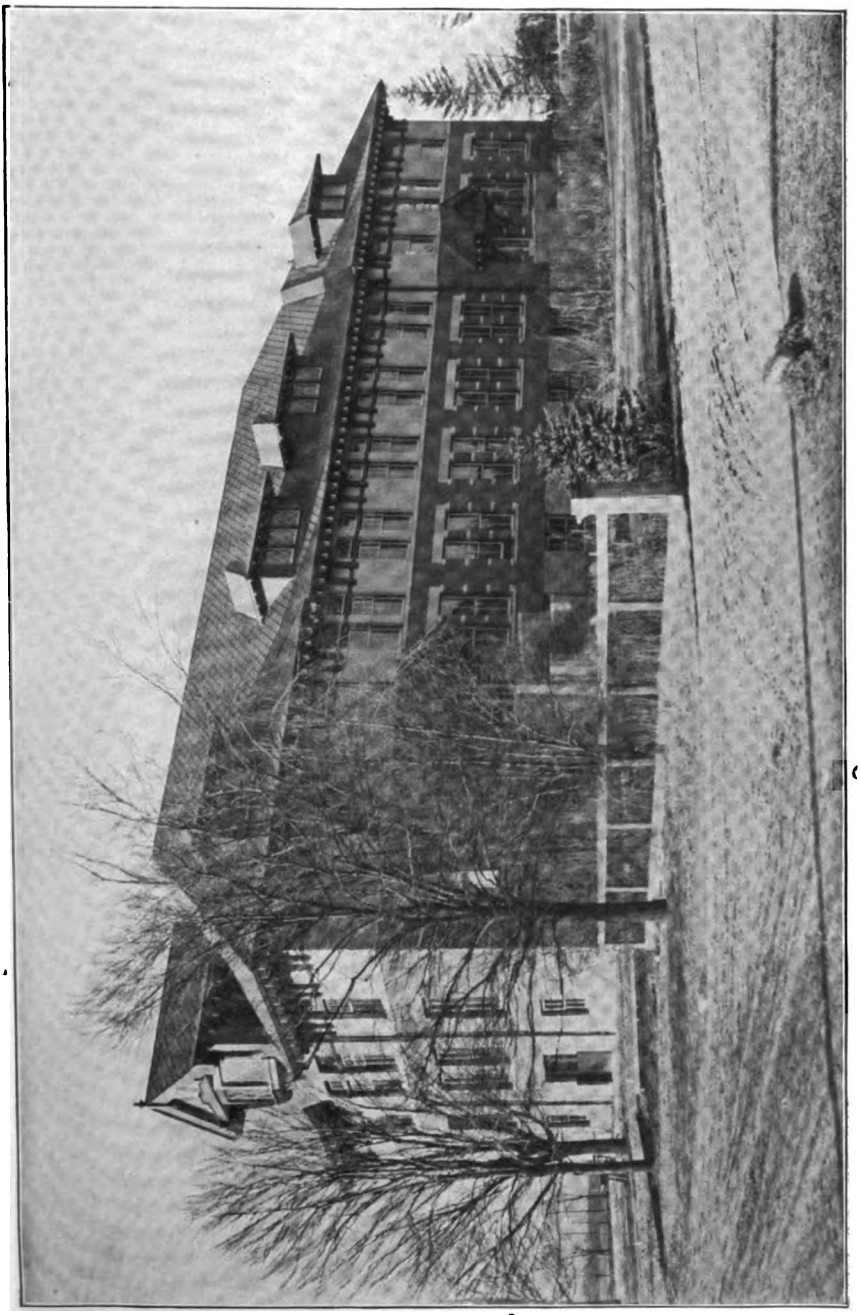

No. 2.—New Building for the Department of Field Husbandry.

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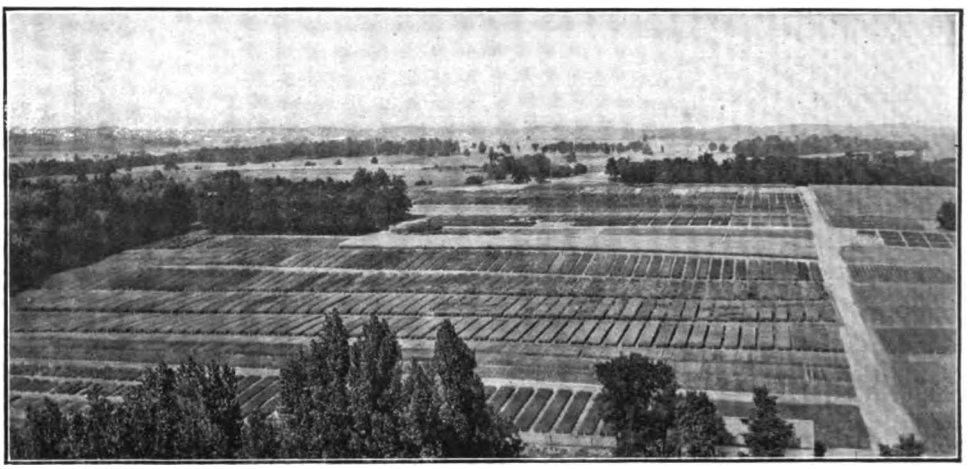
used in 1913 for the first time, and with an addition to one of our barns, we are now well equipped for good work in conducting experiments in field husbandry. For a better understanding of the results which are to follow we here give a few concise statements in regard to the experimental grounds, and the carrying on of the work as conducted in the field plots.

The experimental grounds consist of about seventy-five acres of land, which are divided into upwards of 2,000 plots, and on which experiments are being conducted with varieties of grain, root, tuber, grass, clover, fodder, silage and other crops, with artificial, green and barn-yard manures; with methods of cultivation, selection of seed, dates of seeding, mixtures of grains, pasture grasses, etc.

A greater portion of the grounds has a gentle slope towards the south-west, and a smaller area has a slope towards the north-east, and the soil is what might be termed an average clay loam. The lower portions of the land contain rather more vegetable matter than the higher sections. The greater portion of the land has a four years' rotation, the rotation being: 1st, grain crops; 2nd, cultivated



No. 3.—A view of about twenty acres, or a little more than one-quarter of the experimental grounds.

crops; 3rd, grain crops, and 4th, pasture. This is a special rotation particularly well suited to the experimental work as carried on at the College. About one-quarter of the land is manured each year with twenty tons of farmyard manure per acre; thus most of the land receives an application of farmyard manure once every four years. The manure is applied previous to the cultivated crops. No commercial fertilizers are used except in distinct fertilizer experiments, and these occupy a comparatively small area each year. Within the past fifteen years, one green crop has been plowed under on each section of the field. The plots vary in size according to the requirements of the different experiments, and the yields per acre are determined from the actual yields of the plots in every instance. All of these experiments are conducted with the greatest care, and for several years in succession in order to secure strictly accurate results. These experiments deal with the crops grown on fully nine-tenths of the cultivated land of Ontario. An immense amount of thought and care is required in planning, supervising and examining these plots, and in studying, comparing and summarizing the results for presentation in reports, bulletins, newspaper articles, and lectures.

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There are possibly but few lines of work in which it is absolutely necessary to use so much care in the details. It is also exceedingly important to repeat the experiments for several years in order to get results which are as reliable as possible. All of our field experiments are conducted for at least five years before they are dropped, and many of them are continued for a much longer period of time. For the results of some of the tests which were carried on for five or more years previous to 1913 the reader is referred to former reports. The results of some of the experiments which have as yet been conducted for one or two years are held over until the test can be carried through for at least another summer. As different seasons vary so much in temperature, rainfall, etc., the average results of experiments continued for several years are of much greater value than those secured from one or two season's work. Owing to the great care exercised in the work, and the number of years through which the experiments are continued, we are able to present the results with much confidence in their reliability and in their practical value.

Weather Conditions in 1913.

The weather conditions at the Ontario Agricultural College were nearer normal in 1913 than in 1912. The autumn of 1912 was probably a little drier than normal, the depth of precipitation being 2.6 inches in October, and 1.6 inches in November. The winter was about average, the spring was fairly normal, and the summer although somewhat drier than usual was not nearly so dry as in some of the counties in the eastern and central northern part of the Province. As it is important, for a proper understanding of results of experiments with farm crops, to know the weather conditions in the locality where the experiments have been conducted, the amount of rainfall in each of the summer months in each of the past fourteen years is here presented. The amount of rainfall has been carefully determined in each of these years by the Department of Physics at the College, from which department we have received the information. The following table gives the total amount of precipitation in each of the months April, May, June, July, August and September in each of the years from 1900 to 1913, inclusive:

Inches of Precipitation During the Six Growing Months.

Months.	1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1908.	1909.	1910.	1911.	1912.	1913.	Average fourteen years.
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
April .	1.69	2.24	2.43	2.69	2.10	1.82	1.44	1.66	1.33	3.60	3.13	1.67	1.14	3.53	**2.18**
May..	1.03	3.26	1.67	2.44	3.01	3.89	2.71	2.64	3.47	3.43	2.75	1.64	5.64	1.37	**2.78**
June ..	4.47	1.53	3.06	3.05	2.86	3.24	4.06	1.11	3.21	1.33	.78	.89	1.51	2.03	**2.37**
July...	3.05	4.07	6.43	2.67	4.99	4.60	4.65	1.92	3.25	4.54	1.89	1.95	2.53	3.26	**3.56**
August	.87	3.51	2.18	3.47	3.88	1.98	2.13	.62	2.75	.89	3.18	2.53	6.07	2.88	**2.64**
Sept...	1.52	2.45	3.58	1.48	2.80	2.85	2.49	2.87	.73	.86	3.29	3.42	3.08	1.49	**2.35**
Totals.	12.63	17.06	19.35	15.80	19.64	18.38	17.48	10.82	14.74	14.65	15.02	12.10	19.97	14.56	**15.87**

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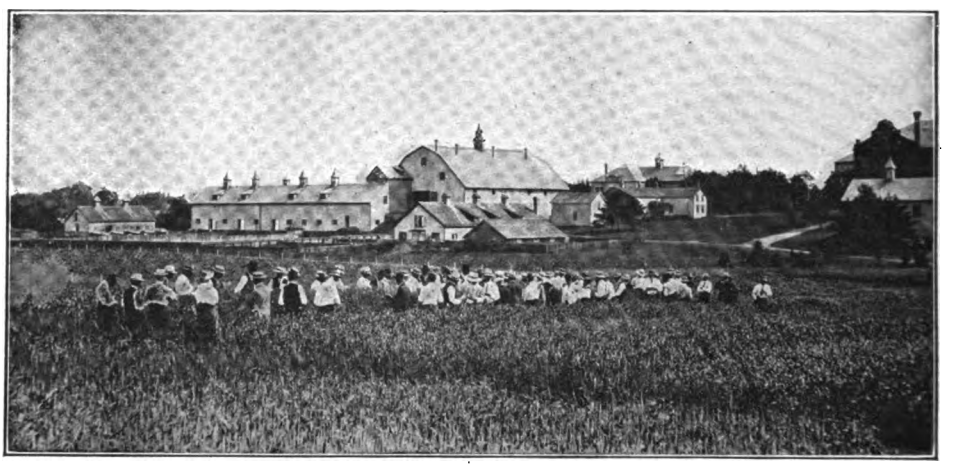
It will be seen that the total number of inches of rainfall at the College during the six months here recorded was about 1.3 inches less than the average rainfall for the corresponding months for the past fourteen years. It will also be noticed that the rainfall in each of the months, with the exception of April and August, was below the average. The month of May had less rain in 1913 than in any year since 1900. This, however, did not prove as serious as it might have been had not the rainfall of the previous month been greater than that of the corresponding month in each of the past thirteen years. Although these two months were extreme in amount of rainfall when considered individually, they were about normal when taken together. The tabulated results show that in the last fourteen years the rainfall was greater than that of the summer months of 1913 in each of ten years and less than that of 1913 in each of three years. It will, therefore, be seen that the rainfall in the six months, April to September inclusive, 1913, was not only less than the average of the past fourteen years by about 1.3 inches, but it was actually less than that of each of ten of the separate years. The results of the experiments for 1913, therefore, presented in the following pages may be considered as those obtained from a comparatively dry summer.



No. 4.—Judges of Standing Field Crop Competitions in Ontario who were attending a two days' course at Guelph, and who were examining a field of the O.A.C. No. 3 Oats when this photograph was taken.

Yields per Acre of Different Classes of Farm Crops.

Although variety work has been discussed throughout Ontario for many years, it seems evident that but little attention has been given to the comparative yields of different classes of farm crops, which after all is the greater question of the two. It seems as though certain crops have been considerably less popular with growers owing to minor objections. It is quite probable that barley, for instance, would be grown much more extensively than it is if it were not for the beards which it produces, and for the unpalatability of the grain when fed unmixed with other grain. These are both minor objections, as the greater part of the barley is now cut with a self binder, and but little barley is fed alone. Experiments show that a mixture of barley and oats will give better results in feeding than either one of these grains when fed by itself. When considering the whole ques-

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tion it is very interesting to compare the productiveness of the different crops one with the other. In order to make these comparisons we have some excellent sources of information. There is probably no Province in Canada, outside of Ontario, or any State in the American Union which has a better statistical record in regard to the crop production than has the Province of Ontario. This information has been collected systematically for the last thirty years. From a study of the reports of the Bureau of Industries for Ontario, we find that the following figures represent the average number of pounds of grain per acre of each of the principal cereal crops as grown in Ontario for a period of thirty years, the grains being arranged in the order of productiveness:

Barley	**1,330**	**pounds**	**Field Beans**	**1,032**	**pounds**
Fall Wheat	**1,260**	"	**Buckwheat**	**974**	"
Oats	**1,207**	"	**Spring Wheat**	**954**	"
Field Peas	**1,158**	"	**Rye**	**918**	"

No.5.—A view of the Oat Plots with the O.A.C. No. 3 in the centre.

It will, therefore, be seen that barley comes at the head of the list, and that oats occupy third place in pounds of grain per acre. It will also be seen that barley has given an average of 123 pounds of grain per acre per annum more than oats for the last thirty years. When we take into consideration the fact that barley produces more digestible nutrients per pound than oats we have a comparison decidedly in favor of the barley as compared with the oats in the production of digestible food constituents per acre. Some people may argue that barley as a rule is sown on better land than oats, that if one grain crop follows another it is usual to sow barley the first year, and oats in the year following. This is true to a certain extent, but nevertheless it does not account for the large difference which we see in the productiveness of these two crops which show that the barley gives an average of about ten per cent. more grain per acre than oats, as may be seen from the results which follow.

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In each of the past thirteen years leading varieties of different classes of farm crops have been compared in duplicate experiments, with the object of securing the comparative yields of the different classes of farm crops when grown under similar conditions. This has been a distinct line of experimental work, and great care has been exercised each year to have the plots uniform in shape, size and character of soil.

The following table gives the average yields of both straw and grain per acre of each of seven classes of farm crops for the thirteen year period:

Class of Crop.	Average yield per acre for 13 years.	
	Straw (tons)	Grain (lbs.)
Barley	1.72	2,591
Emmer	1.92	2,536
Oats	2.29	2,504
Hull›ss Barley	1.69	2,351
Spring Wheat	2.10	1,903
Field Peas	1.47	1,807
Spring Rye	2.05	1,677

No. 6.—O. A. C. No. 3 Oats at the left, and the O. A. C. Yellow Kherson Oats at the right.

It should be remembered that this experiment was conducted in duplicate at the College in each of the past thirteen years, so that we have in the foregoing results the average of twenty-six separate and distinct tests. It will be observed that barley heads the list in pounds of grain per acre in the experiments at the Ontario Agricultural College, as well as in the statistical information for the Province of Ontario as obtained through the medium of the Bureau of Industries. The barley surpasses the oats in productiveness by an average of 87 pounds per acre per annum for the thirteen year period. This difference is not quite as

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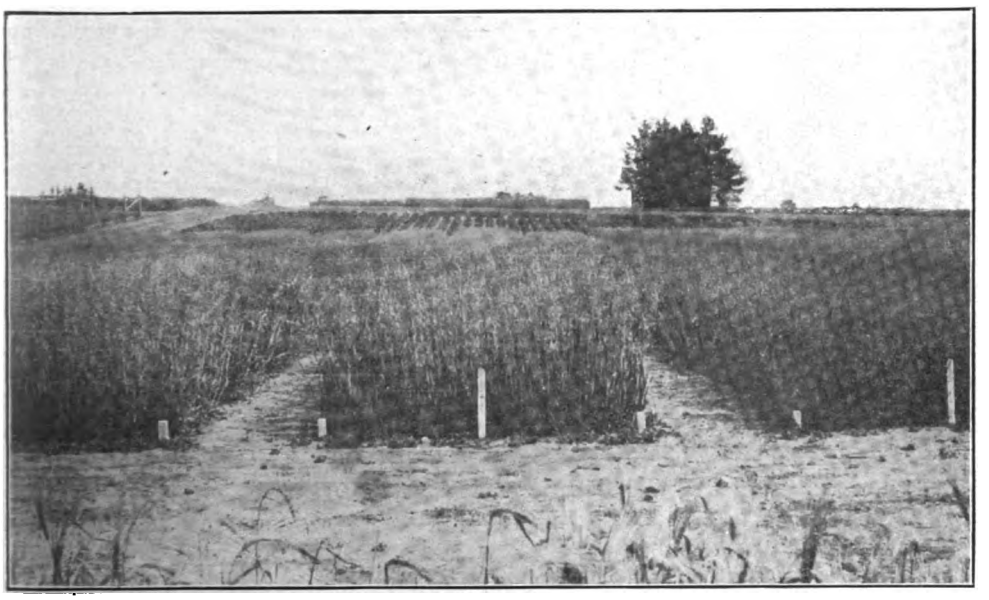
great as that obtained from the results of the Bureau of Industries, but it must be remembered that in the experiments at the College the land was uniform throughout, while in the records for Ontario it is quite probable that the barley was grown under rather more favorable conditions than the oats on many of the farms. It is also interesting to note that Emmer, a species of wheat, has surpassed oats in yield of grain by 32 pounds per acre per annum. The emmer is a wheat which is used for feeding purposes somewhat similar to oats and barley. When the grain is threshed there is not a clear separation of the grain and the chaff, and both of these are ground together in the form of meal. At first it might be considered the emmer would contain a considerable amount of chaff, but on actual determinations which have been made it has been found that the emmer has only about 21 per cent. of chaff, or hull, while the average variety of oats possesses about thirty per cent. of hull. Emmer is considered about equal



No. 7.—The O. A. C. No. 72 Oats are shown in the centre of the picture.

to barley for feeding purposes. Fuller information will be given in regard to emmer, and the other crops here referred to in later portions of this report. It might simply be noted in passing that the average yields of the crops grown at the College for thirteen years are nearly double the yields of similar crops grown throughout Ontario for thirty years, in fact, the yield of oats at the College in comparison with the yield of oats for Ontario is double, with ninety pounds to the good.

Some Evidence Regarding the Lack of a Frequent Change of Seed.

In connection with the experimental work at the College upwards of thirty varieties of farm crops have now been grown continuously from nineteen to twenty-five years without any change of seed, whatever, from one farm to another. These include a number of varieties of oats, six-rowed barley, two-rowed barley, hulless barley, winter wheat, common spring wheat, durum spring wheat and potatoes.

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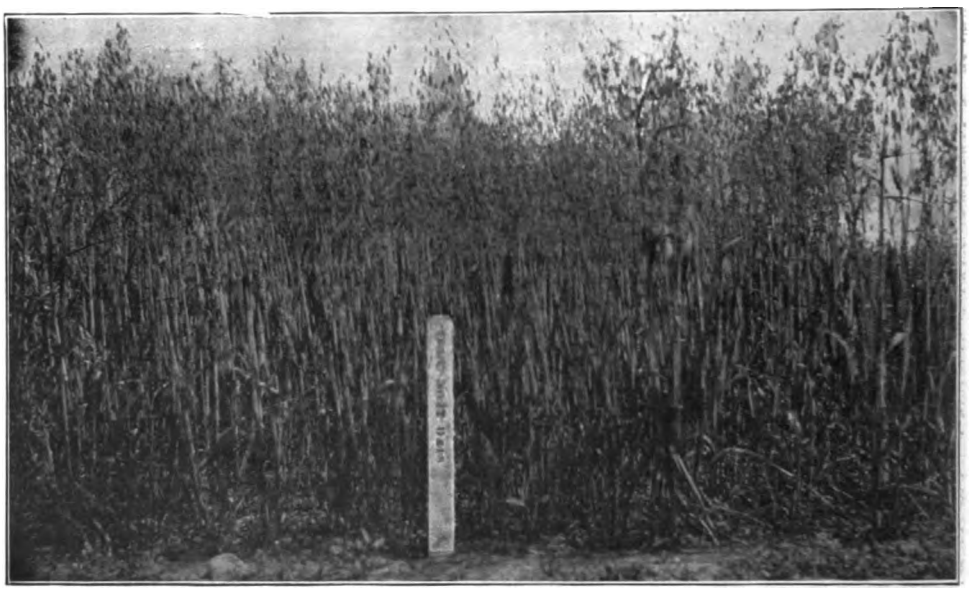
In practically all cases the yields per acre in recent years have been greater than those during the earlier part of the experiment. If we take the average of all the varieties included in this test we find that the yield instead of decreasing has increased somewhat as the years have advanced. The soil on which these varieties have been grown has changed but little in fertility, and no plant selection has been used in this particular test. Some farmers still think it is wise to change seed frequently. A large number of leading farmers, however, are realizing the fact that in very many cases they are able to grow the same varieties for a considerable period of time without any change of seed, providing proper care is taken in growing varieties suitable for the soil, in the careful selection of the seed, and in the cultivation of the land. The Canadian Seed Growers' Association is working largely on the basis that by the careful selection of seed the crop of an old standard variety can be improved by continuous selection, and that the high qualities of newly bred varieties obtained from the Experiment Stations can



N. 8.—The O. A. C. No. 72 Oat is a strong, vigorous and a high yielder of grain.

be maintained for many years by the method of selection which they recommend. From experiments which have been conducted at Guelph during the last quarter of a century it seems quite possible to grow the same varieties for a considerable length of time without change of seed, providing care is taken in the selection of the seed, and in the growing of the crop.

The Importance of Crop Rotation.

Much has been written, and a great deal has been said from the Institute platform in regard to rotation of crops, and yet it is one of those problems which apparently requires further emphasis. No one who gives the question of rotation of crops in Ontario careful study can but feel that there is still a great lack in the practical application of this question on many of the farms of Ontario. Some of the crop growers do not give the question of rotation enough consideration,

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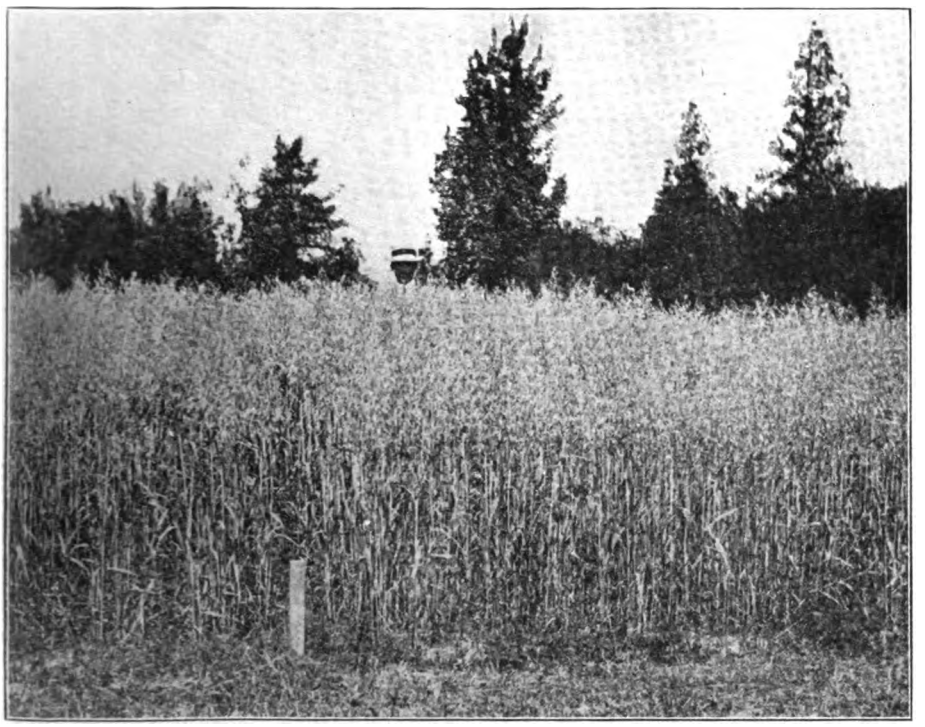
and others do not know just how to work out the rotation which is best for their own particular circumstances. Crop rotation is a subject which requires individual attention. There is no one rotation which will apply equally well to all circumstances. There are no conditions, however, in which one certain rotation will not give decidedly better results than some other rotations which might be followed. It is, therefore, of the greatest importance that the individual farmers will give this matter their very careful consideration. It would pay them handsomely to spend evenings in thinking over and discussing the requirements of the farm so as to furnish the most satisfactory results when taking into consideration a special line of farming, the proximity of the market, the quality of the soil, the water supply, the amount of available labor, and many other items which necessarily



No. 9.—O. A. C. No. 72, Oats grown in Prince Edward County.

come into consideration. In arranging a rotation it is exceedingly important to have the crops placed in such a way that each crop, as far as possible, will be a preparation for the crop following. If this suggestion is not considered it may be found that some of the crops of the rotation may furnish the most unfavorable conditions for the crop which follows. If the matter received sufficient attention, however, it would be found that in nearly all rotations the greater number, if not all the crops in the rotation, might have a direct benefit on the crop which is to be grown on the same land in the following year. In order to illustrate this point let us consider the following short rotation: 1st, grain; 2nd, clover; 3rd, cultivated crop. In this three years' rotation the grain will form the nurse crop for the clover which is becoming well established in the land while the grain is growing. In the second year the clover has a very beneficial influence on the

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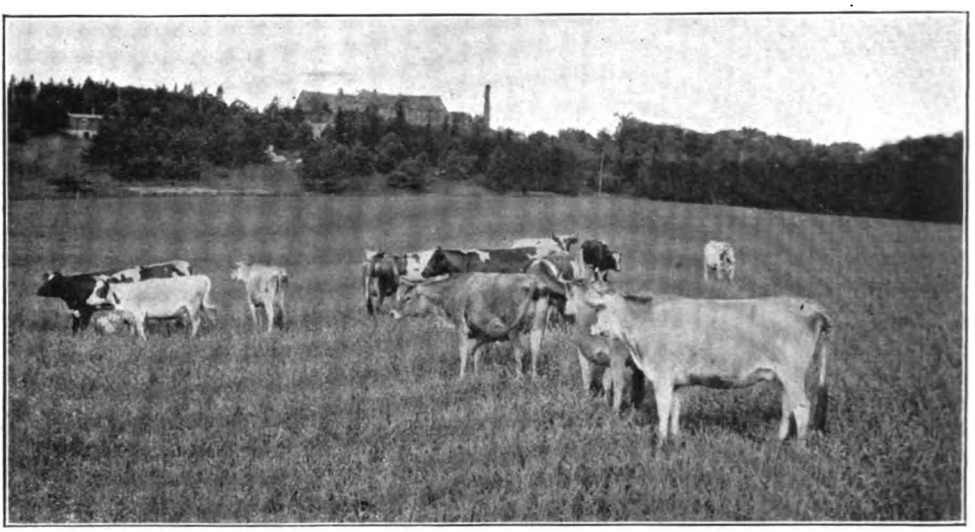
soil in drawing mineral constituents from the sub-soil, and nitrogen from the atmosphere, in adding humus to the land, and in making the soil more friable and open. In the third year the cultivated crop if looked after properly will liberate plant food, help to clean the land of weeds, and form a good seed bed for the grain which is to follow in the succeeding year. It will be seen in every case each crop has a marked influence in making the conditions suitable for the crop of the following year. The general rotation of crops used on the farm proper here at the College is one of four years, and is as follows: 1st year, grain crops; 2nd and 3rd years, hay and pasture; and 4th year, cultivated crops.

One of the most difficult problems in handling land which has been devoted to experiments is to arrange the crops in such a way as to follow a reasonable and a satisfactory rotation. In order to arrange such a rotation the agricultural



No. 10.—Fourteen cattle grazing on about ten acres of Annual Pasture from a mixture composed of 51 lbs. of oats, 30 lbs. of Early Amber Sugar Cane, and 7 lbs. of Common Red Clover Seed per acre.

conditions of a district have to be carefully studied, and the various requirements of the experiments under way have to be taken into consideration. To get the crops to follow each other in such a rotation that all the essential features of a good rotation may be realized, and at the same time so that the rotation will fit in nicely with the experiment, and will meet the sanction of the most progressive farmers, is a difficult matter. After carefully considering this question the following rotation was adopted for the greater area of our experimental grounds: 1st year, grain; 2nd year, cultivated crops; 3rd year, grain, and 4th year, pasture. This rotation has given us about the right proportion of land for our experiments with grain, and with cultivated crops. It has appealed to the farmers as a reasonable rotation, it has furnished a cleaning crop, and it has supplied a leguminous crop in the pasture. As it has been necessary for us to work out a rotation to meet the very peculiar conditions of our experimental work, so it is important for each farmer to work out for himself the rotation that will give him the most satisfactory results to meet his own particular requirements and conditions.

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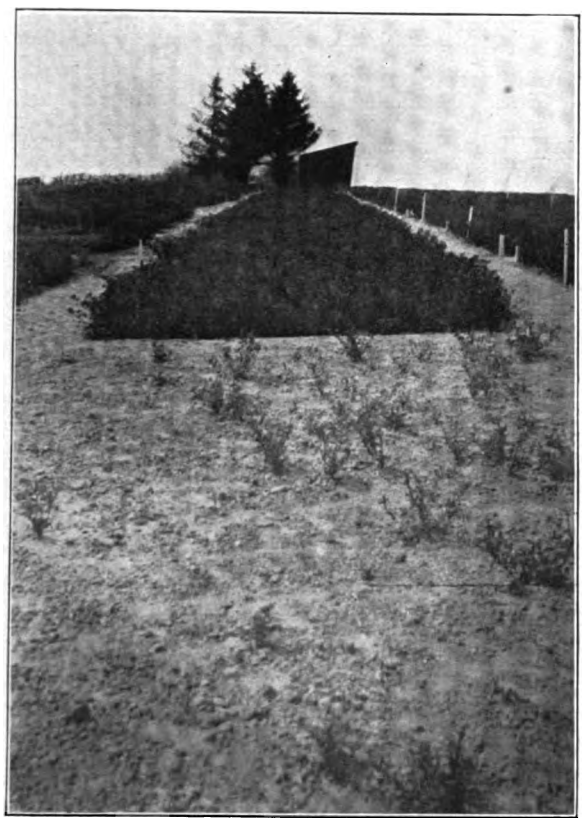
Varieties of Farm Crops.

It is of the utmost importance that an Experiment Station should study carefully the existing varieties of farm crops which are suitable for the conditions under which they are to be grown in the country. Not only is this true for the object of securing the very best kinds of farm crops for cultivation in themselves, but also to form a basis of crop improvement through selection and hybridization. While it is true that an Experiment Station should make a very careful study of the different varieties of farm crops, it is also true that the farmers themselves



No. 11.—Common Alfalfa, grown from Colorado seed in the foreground, and Ontario Variegated Alfalfa grown from Ontario seed in the background. The seed of each lot was sown in the spring of 1909, and both did well the first year. The Common Alfalfa from Colorado has been killing out in each of the past three years until it has all disappeared with the exception of a few plants.

should be exceedingly careful to secure for their own practice on the farm those varieties of farm crops which are likely to give the very best returns under the peculiar and the special conditions of the farm itself. As an important factor in assisting the farmers to make this selection the Experiment Station occupies a most important place. The more attention the farmers will give to the carefully conducted tests of the Experiment station, and the least attention to agents who go from house to house wih highly colored photographs, and extravagant

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descriptions of varieties, the better not only for the farmers themselves, but for the country as a whole. One of the great drawbacks in the agriculture of Ontario, is the fact that there are so many different varieties of farm crops under cultivation. It is very difficult, indeed, for buyers to go into Ontario districts and buy carload lots of either oats or potatoes of a uniform quality. There are so many varieties in cultivation that the product is uneven, and the farmers are compelled in most cases to rely on their local markets, and as a consequence potatoes are being imported from New Brunswick, and oats from some of the Western Provinces, neither of which should be necessary only in exceptional cases, if our farmers would have greater co-operation in the growing of only a few of the very best kinds. From the work of the Experiment Stations, and from the co-operative work of the Experimental Union excellent information is now being obtained as to the best varieties of farm crops to be grown under average conditions, and through a series of years. The results of experiments conducted at the Ontario Agricultural College show that there is a tremendous difference in the different varieties, and if the farmers are going to obtain the best results upon their individual farms and in the various localities it is essential that they select only those varieties which will give them the very best results, not only on their own farms, but also in the separate localities. There are wonderful opportunities in Ontario for co-operative societies for the production of high class seed of the very best varieties. The Canadian Seed Growers' Association is now organizing seed growing centres, and we believe that this work will have a wholesome influence not only for the members of these local organizations, but also in the advancement of a better crop production in our Province. In carrying forward this great work the results which are presented in this report should prove of inestimable value as many of the experiments have been conducted for a number of years.

The Value of Seed Selection.

Seed selection is one of the most important factors in successful crop production, and yet it is one of the features that is very frequently neglected. Extensive experimental work has been conducted at the College with the object of ascertaining definite information regarding the influence of different selections of seed on the resulting crops. In experiments which were reported in 1912 with root crops, the results showed that in every instance, the large seed produced greater yields than the medium sized seed, and that the medium sized seed produced greater yields than the small seed. This was true as it applied to mangels, sugar beets, swede turnips, fall turnips and carrots in experiments which were conducted for a period of five years in every instance.

An experiment has been conducted for five years in succession in which both small and large sized seeds of each of four varieties of oats have been planted at seven different distances apart. The object of this experiment has been to endeavor to find out whether the maximum yield which could be obtained from large, plump seed would be different from the maximum yield which could be obtained from small, plump seed. From the results of the five years' experiment we learn that the maximum yields from the large, plump seeds have been greater than the maximum yields from the small, plump seed in fully 90 per cent. of all the tests which have been made. We are obtaining some most interesting and valuable information from this experiment, and hope to have the results worked up in greater detail so that the many lessons can be emphasized and published more fully at a later date.

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In another experiment which has been conducted at the College for many years heavy and light oats have been grown continuously in comparison with each other, and the results are instructive. The heavy oats have surpassed the light oats in appearance of grain, in weight of grain per measured bushel, and in yield of both straw and grain per acre. In 1913, the yield per acre from the large, plump oats was 63.5 bushels, and from the light seed was 51.9 bushels per acre. The results in 1913, however, were not as marked as in some of the other years, as for instance, in 1912 the difference was 20 bushels per acre in favor of the large, plump seed.

Probably one of the most interesting experiments which has been carried on at the College in the selection of seed is one in which different selections were made of the various classes of grains, and the experiments were repeated for from six to nine years. As every farmer should become familiar with the average results of this experiment we shall here present the data somewhat in detail. For this experiment, fresh seed had been taken each year from the general crop of grain grown either on the Farm proper or in the Experimental department. It will, therefore, be understood that whatever difference there is from the influence of the selection of seed, that difference is attributed entirely to the careful selection of the seed for the separate years in which the tests were made. For the large, plump seed, none but well developed grains were selected; for the small, plump sample, the grains selected were of a uniform character; and for the shrunken sample, none but shrunken grains were used, the last selection being made regardless of the size of the kernels. The sample of broken grain, in the case of barley, contained nothing but grains which had been broken crosswise; split grain, in the case of winter wheat, contained nothing but grains which were broken lengthwise; and split seed, in the case of peas, contained peas which were split and not broken. The grain from which these selections were made was all threshed with a grain separator, and the splitting and the breaking of the grains were, therefore, done in the usual process of threshing. In the selection of large, plump seed, one-half pound was carefully weighed from each class of grain. The number of large, plump seeds of each kind of grain was then counted, and a corresponding number was taken of the medium sized grain, the small, plump grain and the shrunken grain. In the case of the broken or split grain, twice the number of the half kernels, as compared with the whole grains, were used. The different selections were carefully sown upon plots of similar size. The average results of each of these selections which were made from six to nine years are presented in tabulated form.

The results which are presented are very interesting and important in showing the influence of one year's selection of the seed of the principal farm crops which are grown in Ontario. In every instance, the large, plump seed gave a greater yield of grain per acre than small plump, shrunken or broken seed. From a practical standpoint, it seems to be excellent practice, not only to sow clean seed grain that will be free from weed seeds, but to have the cleaning so thoroughly done that none but the very best seed is secured. When this practice is carried out, an important step has been made towards the obtaining of high yields of grain of superior quality.

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COMPARATIVE RESULTS FROM SEED SELECTIONS.

Selections.	Class of Grain.	Years the tests have been repeated.	Weight per measured bushel. (pounds)	Average yield per acre per annum.	
				Tons of Straw.	Bushels of grain by weight.
Large seed.....	Oats	7	33.2	1.9	62.0
Medium sized seed....	"	7	32.2	1.8	54.1
Small seed.....	"	7	31.8	1.8	46.6
Large plump seed	Barley	6	49.5	1.5	53.8
Small plump seed	"	6	48.8	1.5	50.4
Shrunken seed	"	6	49.1	1.4	46.0
Broken seed.....	"	6	48.6	1.3	43.2
Large plump seed.....	Spring Wheat...	8	59.1	1.4	21.7
Small plump seed	" "	8	58.3	1.3	18.0
Shrunken seed	" "	8	56.9	1.2	16.7
Large plump seed	Winter Wheat ..	6	59.4	2.6	46.9
Small plump seed	" " ..	6	59.2	2.2	40.4
Shrunken seed	" " ..	6	59.1	2.1	39.1
Split seed.....	" " ..	6	54.2	.6	9.3
Large seed.....	Peas	6	56.3	1.3	28.1
Small seed.....	"	6	56.3	1.1	23.0
Sound seed.....	Peas	9	58.1	1.4	29.2
Split seed.....	"	9	57.9	.6	10.2

In 1913 an experiment was conducted for the first time in testing different selections of seed of spring rye. While no definite conclusions can be drawn from one year's work it might be stated that the results so far correspond very closely with the average results from the selection of seed of the other kinds of grain. In the yield of grain per acre the large seed surpassed the medium sized seed by 1.2 bushels per acre, the small seed by 3.2 bushels per acre, and the broken seed by 16.3 bushels per acre.

PLANT SELECTION AND HYBRIDIZATION.

The results which we have reported from experiments in the selection of seed are exceedingly important from the farmer's standpoint. They have shown that more vigorous and more productive plants have been obtained from large plump seeds than from small plump, shrunken or broken seeds when similar varieties have been used in the test. We believe that these results are of great value in showing that in ordinary farm practice it is advisable to clean the seed so thoroughly that none but the best is sown. For plant improvement, however, it is wise to go beyond the mere selection of the seed and to make the selections from individual plants, and even in some cases different varieties might be cross-fertilized in order to produce new varieties which are superior to the old standard sorts. The Department of Field Husbandry has felt justified in giving a considerable amount of attention to the improvement of some of our best varieties of farm crops through systematic selection, and in some instances by means of cross-fertilization. For the work in selection thousands of plants of the same

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variety have been grown at equal distances apart so as to give an opportunity for a careful study of the individual plants. As a result of this work we are now growing a number of selected strains of much prominence. These will be referred to in detail in the future pages of this report. One new variety of barley, the O.A.C. No. 21, is already well established in Ontario, and is now grown very extensively. The O.A.C. No. 72 oats was distributed for co-operative experiments in the spring of 1911, and is now increasing very rapidly. From the three hundred one pound lots which we distributed two years ago last spring there were thousands of bushels grown this year. The O.A.C. No. 3 variety of oats was distributed in the spring of 1913 for the first time. It is an exceedingly promising variety of early oats of very superior quality.

The amount of work in cross-fertilization which has been carried forward during the last few years has been quite extensive. The object has been to secure new varieties which are more suitable for Ontario than even the best of the named varieties which have been obtained through our extensive system of experimental work with about two thousand different kinds. We are now experimenting with quite a large number of cross-bred varieties of oats, barley, winter wheat, spring wheat and peas.

Farmers' Co-Operative Experiments.

It is probably safe to say that we have the largest and the most complete system of co-operative experiments in agriculture which is to be found in any country. This work was started in 1886, and has been carried on continuously in each of the past twenty-eight years. In 1913, the co-operative work was conducted on farms throughout Ontario in agriculture, apiculture, forestry, agricultural chemistry, agricultural botany, and in connection with the Public Schools in elementary agriculture, horticulture and forestry. The increase in the number of experimenters in agriculture can be seen from the following figures which show the average yearly number actually engaged in the work in each of the four periods during the last twenty-eight years:

Four-year Periods.	Average number of Experimenters per annum.
1886-1889	73
1890-1893	557
1894-1897	2058
1898-1901	3157
1902-1905	3533
1906-1909	4231
1910-1913	4538

This system of co-operative work has a very wholesome influence throughout the Province of Ontario. The principal conclusions from the carefully conducted co-operative experiments are presented and discussed at the annual meeting of the Experimental Union. The proceedings of the annual meeting, with the results of the co-operative experiments, are printed in the Annual Report of about one hundred pages. For further information regarding the results of co-operative experiments in agriculture in Ontario the reader is referred to the Annual Reports of the Ontario Agricultural and Experimental Union.

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Loose Smut in Oats, and Stinking Smut in Wheat.

A considerable amount of experimental work has been conducted in the Experimental Department in testing out in a practical way some of the most highly recommended treatments for the loose smut of oats, and the stinking smut of wheat. As this question is of so much importance in connection with the agriculture of Ontario we wish to emphasize the results of these investigations. Great losses frequently occur through the prevalence of the smuts in the grain crops. The spores of the smuts correspond with the seeds of the grains, and germinate and grow when the conditions of heat, moisture and food become favorable. The smuts are fungus plants which enter the tissues of other plants such as those of wheat, oats, barley and corn, where they live and grow, and finally produce smut spores. The reproductive organisms of the loose smut of wheat and the loose smut of barley may exist in the tissues of the ripened grains, and it is, therefore, difficult to kill these two smuts, and also to retain the vitality of the wheat and the barley. Although the hot water treatment may be effectual in killing these smuts, it is rather difficult to carry out satisfactorily in ordinary farm practice. It is important to secure seed wheat and seed barley from farms which are not infested with the loose smut of these grains. There is no effectual method known for preventing the smut of corn by a simple treatment of the seed as the disease may attack any part of the tender growing plants at any time. The smut masses of corn should be gathered and burned and the spores thus prevented from being scattered on the land or embodied in the manure. The spores of the loose smut of oats and of the stinking smut of wheat which attach themselves on the outer surfaces of the ripened grains can be readily killed by treatment. This fact is of great agricultural and economic importance. The information here presented should prove of much value in showing by actual experimental evidence that the loose smut of oats and the stinking smut of wheat can be completely and satisfactorily destroyed, and that crops entirely free from these diseases can be procured. If farmers grow wheat and oats which are infested with these smuts, they have themselves to blame. With a little care they can keep their farms practically free from these two pests which have frequently caused heavy losses in past years.

For five years in succession experiments have been conducted at the Ontario Agricultural College for the prevention of the loose smut in oats and of the stinking smut of wheat. Careful determinations were made each year to ascertain the comparative influence of different treatments. There were in all, seven treatments for oats, and five for wheat. In every instance, one sample was left untreated as a basis of comparison. An experiment was conducted in duplicate with oats, and also with wheat each year, there being two varieties of each class of grain used for the experiment. The seed grain was obtained each year from a known source, and where no treatment for smut had been attempted for several years previously. The following treatments were used throughout with the exception of numbers 3 and 6 which were omitted from the treatments for the stinking smut in wheat.

(1) *Untreated.* One sample of oats and one sample of winter wheat of each variety were left untreated, in order that the influence of the various treatments might be better observed.

(2) *Immersion in Hot Water.* The grain was placed in a bag and immersed in water at about 115 degrees F. Soon afterwards, it was placed in water which was kept at a temperature of between 130 degrees and 135 degrees F. The grain

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was occasionally stirred and was allowed to remain in the water for a period of fifteen minutes. It was then spread out on a clean floor to dry, where it was stirred occasionally.

(3) *Immersion in Bluestone Solution for Five Minutes.* A strong solution was made by dissolving one pound of copper sulphate (bluestone) in one gallon of water, and the oats were immersed in the solution for a period of five minutes.

(4) *Immersion in Bluestone Solution for Twelve Hours.* The bluestone solution was made by dissolving one pound of bluestone in twenty-five gallons of water, and the grain was immersed in this solution for a period of twelve hours.

(5) *Sprinkling with Bluestone Solution.* The solution was made by dissolving one pound of bluestone in ten gallons of water, which was used for sprinkling over the grain until it was thoroughly moistened after being carefully stirred.

(6) *Immersion in Potassium Sulphide Solution.* The potassium sulphide treatment consisted of soaking the oats for two hours in a solution made by dissolving eight pounds of potassium sulphide in fifty gallons of water.

(7) *Immersion in Diluted Formalin.* The solution of formalin (40 per cent. formaldehyde) used for the immersion process with oats and with wheat was made by pouring one-half pint of the formalin into twenty-one gallons of water, and the grain was immersed in this solution for a period of twenty minutes, during which time it was stirred occasionally.

(8) *Sprinkling with Diluted Formalin.* One-half pint of formalin was poured into five gallons of water and the grain was sprinkled with this solution and stirred until it was thoroughly moistened.

After the treatments had been made for a few hours, and the grain had become sufficiently dried, it was carefully sown on separate plots. When the winter wheat was about ready to cut, it was carefully examined and the heads containing stinking smut were gathered and shelled. The rest of the crop was then threshed and again examined for any smut balls from heads which had been missed in the standing crop. When the oats were coming into head they were examined frequently and all smutted heads were removed and carefully counted. The accompanying tables give the average results in percentage of grains of winter wheat affected with stinking smut and of the heads of oats affected with loose smut in each of the five years during which each experiment was conducted. Besides this information, the average yield of oats per acre for the five years and the average yield of winter wheat per acre for three years are included.

The results show that the greatest yields of both winter wheat and oats per acre were produced from the grain which was immersed for twenty minutes in a solution made by adding one-half pint of formalin to twenty-one gallons of water. They also show that this treatment was effectual in completely killing the smut. Of the different bluestone treatments for smut in oats the most effectual was No. 4, but even that was not as satisfactory as the treatment in which the oats were placed in the formalin solution. It will be observed that No. 3 and No. 4 treatments with oats apparently injured the germination of the seed slightly and consequently lowered the yield of grain per acre. It will also be noticed that the sprinkling with the formalin solution reduced the yield of winter wheat, the average being nearly two bushels per acre less from the treated than from the untreated seed.

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RESULTS OF EXPERIMENTS TO KILL THE LOOSE SMUT OF OATS.

Materials.	Percentage of smut.						Average yield of grain per acre 5 years. bus.
	1st year test.	2nd year test.	3rd year test.	4th year test.	5th yr. test.	Average 5 yrs.	
1. Untreated	5.5	3.9	11.6	4.3	3.4	5.7	60.3
2. Hot water.....	.0	.0	.0	.1	.0	.0	63.7
3. Bluestone—5 minutes..	1.7	.9	.7	.6	.1	.8	58.5
4. Bluestone—12 hours ...	.6	.0	.0	.1	.0	.1	56.0
5. Bluestone—Sprinkled ..	.9	2.0	1.4	.6	1.6	1.3	61.8
6. Potassium Sulphide....	3.4	.1	.3	1.5	.7	1.2	66.2
7. Formalin—Immersed ..	.0	.0	.0	.0	.0	.0	68.3
8. Formalin—Sprinkled ..	.0	.1	.0	.0	.0	.0	61.3

RESULTS OF EXPERIMENTS TO KILL THE STINKING SMUT OF WHEAT.

Materials.	Percentage of smut.						Average yield of grain per acre 3 years. bus.
	1st yr. test.	2nd yr. test.	3rd yr. test.	4th yr. test.	5th yr. test.	Average 5 yrs.	
1. Untreated	3.6	9.3	.6	.6	6.8	4.2	38.0
2. Hot water	.0	.0	.0	.0	.0	.0	40.6
4. Bluestone—12 hours ...	.0	.0	.0	.0	.0	.0	40.2
5. Bluestone—Sprinkled ..	.0	.2	.0	.0	.1	.1	41.1
7. Formalin—Immersed...	.0	.0	.0	.0	.0	.0	43.3
8. Formalin—Sprinkled...	.0	.0	.0	.0	.0	.0	36.3

The formalin which was used in the experiments was the same as a 40 per cent. formaldehyde solution. The material is a clear liquid, which can be purchased from almost any druggist, and the prices range from thirty to fifty cents per pint. When purchased in larger quantities, and especially from the manufacturers, the cost is much less proportionately. It can be purchased either under the name of formalin or of formaldehyde, but when under the latter name it should always be mentioned that it is the 40 per cent. solution which is required. One pint of formalin should be sufficient for treating from ten to twenty bushels of grain as several treatments may be made with the same solution, each lot of grain requiring to be immersed for twenty minutes. If the treatment is done in a barrel the grain could be placed in a bag made of very coarse material, the bag being about three-quarters filled with grain. After the treatment is made the grain should be spread thinly on a floor or on canvas where it can be stirred, and allowed to dry sufficiently to be sown. The sooner it is sown after treatment the better. If the damp grain is placed in bags, in the drill or in any closed place for a few hours there is danger of the vitality of the seed becoming weakened. We treat on an average about one hundred bushels of wheat and oats at the College each spring, and have always met with success when using the immersion treatment with the formalin solution as here described. The treatment is easily applied, and is comparatively cheap. It is effectual in completely killing the loose smut of oats and the stinking smut of wheat, and in producing the largest average yields of these grains per acre of all the treatments used.

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Smut Immunity in Oats.

Only a few years ago there was but little knowledge as to the susceptibility of different varieties of oats to the attacks of smut. From observations which were made in the Experimental Department it seemed evident that some varieties were much more immune to the attacks of smut than were others. A careful study has therefore, been made of a few of the varieties of oats in order to glean fuller information on this important question. The following table gives the number of smutted heads per plot found in each of five varieties of oats in each of twelve years:

Variety.	Number of Smutted Heads per Plot.											
	Before treatment.				After treatment							
	1902	1903	1904	1905	1906	1907	1908	1909	1910	1911	1912	1913
Early Ripe	0	0	3	0	0	0	0	0	0	0	0	1
Joanette	20	9	10	18	0	2	12	1	0	0	3	4
Siberian	32	43	78	20	0	1	0	0	5	0	1	4
American Banner	116	303	317	22	0	3	2	4	5	0	2	6
Black Tartarian	332	608	369	62	0	3	12	15	29	25	16	44

Only once during the twelve year period were these oats treated so as to destroy the smut spores. The treatment used was by immersing the oats for twenty minutes in a solution made by mixing one-half pint of formalin into twenty-one gallons of water. This treatment took place in the spring of 1906. The results show how very effectual was the treatment, and that if a treatment is carefully done it lessens the amount of smut for many years without further treatment, providing care is exercised in the handling of the crop. It is difficult, however, to take sufficient care so as to prevent a small amount of smut appearing in the grain from year to year. The results presented in the foregoing table show that the Early Ripe appears to be almost immune to the attacks of smut, there being only three heads in 1904, and one head in 1913. As these oats are grown in land which has a four years' rotation, and which is manured once during that rotation, there is a possibility of there being a slight mixture of oats, and it is possible that these few heads which have appeared might be from a little mixture of some other variety. In comparison with the Early Ripe it will be seen that the Black Tartarian is extremely susceptible to the attacks of smut. The high number of smutted heads show both in the favorable and the unfavorable years, and both before and after the grain was treated. The results seem to indicate very strongly that there is a great difference in the varieties of oats regarding their susceptibility to the attacks of smut.

Thickness of Seeding in Cereal Grains.

It seems strange that in this age of agricultural development the subject as here presented should be the basis of a new line of investigation. The question of the amount of seed of the cereal grains to be sown for the best results has been discussed many times and in many places. Experiments have also been conducted

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with the object of securing information on this problem in different countries, and yet we have reached no unanimity in regard to the matter. We find, for instance, in Canada that the amount of oats which are sown per acre will vary from one to four bushels, and in Scotland the quantity frequently reaches six bushels of seed per acre. We find very strong advocates of using as small a quantity as one bushel of oats per acre, while others will argue as earnestly for the advisability of using as high as six bushels or more per acre. The question then arises as to why there is such a difference in the views of men who have had wide experience in the growing of grain upon their individual farms. I think we are safe in coming to the conclusion that these variations are caused partly on account of knowledge, and partly on account of ignorance. It is undoubtedly true that the amount of seed per acre which would give the highest results under certain circumstances would not give the highest results under other conditions. There are many factors which exert an influence in determining the quantity of seed to use to give the best returns, each of these factors producing its own particular influence. The fertility of the soil, the state of cultivation, the moisture content of the soil, the variety of the crop, the method of seeding, the date of seeding, and many other factors apparently exert their respective influence in regard to the amount of seed to be sown in order to secure the highest returns. If this be true it can readily be seen that we cannot come to a definite conclusion regarding the quantity of seed to use per acre of any class of farm crops which would give the highest returns under all circumstances. Nevertheless, it must be admitted that definite knowledge regarding the influence of some of the factors above referred to is very meagre, indeed. We believe as knowledge along these lines accumulates we shall be in a very much better position to know what is likely to give satisfactory results under the varying conditions in which a crop is to be grown. We believe, therefore, that any new and definite information obtainable which will throw additional light on this problem will be appreciated. I am pleased to present at this time the preliminary results of an experiment which was started at the Ontario Agricultural College in 1909, and which has now been conducted in each of the past four years.

A discussion has recently taken place in the United States in regard to seed selection on the influence of crop production, and a discussion also took place in Canada regarding the stooling of oats in reference to the yield of grain per acre. To glean information especially on these two points an experiment has been conducted in each of four years by using both large and small seed of heavy stooling, medium stooling and light stooling varieties of oats, and by planting the seed of each variety in squares one, two, three, four, six, eight and twelve inches apart. The seed was planted by hand, and with very great care. Each plot was surrounded by oats of the same kind, and planted in the same way. When the crops were ready to harvest the surrounding plants were removed so that the crops under experiment would not be influenced by the paths surrounding the plots. After the seed had germinated and the oat plants had appeared above the ground notes were taken in regard to the stooling of the plants every twenty-four hours. Other notes in regard to height, amount of rust, strength of straw, etc., were taken at the proper times. Each plot was harvested with great care. The actual number of heads on each plot were counted. The weight of the total crop was determined, and after threshing was completed the amount of grain was subtracted from the entire crop, thus furnishing the combined weight of straw and chaff. The following table gives the average results of thirty-two tests made in four years by planting oats at seven different distances apart:

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RESULTS FROM DIFFERENT QUANTITIES OF SEED OATS PER ACRE.

Inches between Plants.	Seeds per Acre.		Heads per Plant.	Per cent. of Heads per Acre.	Height (inches)	Per cent. Lodged.	Per cent. Rust.	Days to Mature.	Pounds per Bushel.	Yield per Acre.	
	Lbs.	Bus.								Straw Tons.	Grain. Bushels.
1	414.4	12.34	1.0	100	20.4	5.6	11.8	91	25.0	1.75	30.60
2	104.0	3.06	1.1	31	27.8	11.9	15.0	93	31.4	1.58	34.95
3	46.1	1.36	1.3	17	32.6	12.8	17.8	94	33.2	1.52	41.73
4	26.0	.76	2.0	13	33.1	29.9	20.9	95	31.5	1.29	38.99
6	11.6	.34	4.2	12	35.3	35.8	25.4	97	28.6	1.40	37.42
8	6.5	.19	6.5	11	34.9	34.7	27.7	99	26.4	1.20	31.77
12	2.9	.09	11.2	9	34.9	30.1	33.2	100	23.9	1.03	21.93

In an experiment of this kind it is usually considered wise to extend the experiment into extreme conditions, hence, in the thickest seeding the oat grains were planted one inch apart each way, which would require on the average a little over twelve bushels of seed per acre. In the thinnest seeding the oat grains were planted one foot apart each way, which would require only about one-tenth of a bushel or a little less than three pounds of seed per acre. Some of the intermediate seedings, however, approximate more closely the quantities of seed which are used in actual practice, as for instance, where the grains were planted two inches apart each way it required about three bushels of seed per acre, and where the seeds were planted three inches apart each way the amount of seed required would be about one and one-third bushels per acre. We expect to start another experiment in which several different thicknesses of seeding will be used, but the range will probably run from about one bushel to four bushels per acre.

The foregoing average results are worthy of very careful consideration. It is probably the first time that an experiment of this kind has been conducted in the manner here described. It should be remembered that each column represents the average of thirty-two distinct experiments. Those experiments covered a period of four years which included an exceptionally dry season, and an exceptionally wet season. The yields of grain per acre are much lower than we usually obtain in the experimental grounds at Guelph. This is due to certain reasons, one reason being the unfavorable weather conditions of some of the years, and another reason being the fact that we conducted the experiment on land which would be unlikely to cause the straw to become badly lodged, especially in a wet season. Even though this precaution was taken the crop lodged considerably, especially in 1912, when the weather conditions were conducive to a large yield of straw of a succulent character.

The fourth column from the left shows that the number of heads or stools of an oat plant can be regulated largely by the thickness of seeding. When the seeds were planted one inch apart each way there was only an average of one head per plant, and when the seeds were planted twelve inches apart each way there was an average of eleven heads per plant. The number of heads per plant increased according to the increase in the distance between the plants.

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In the fifth column we have the comparative number of heads from equal areas of land. Where the seeds were planted one inch apart there were one hundred and forty-four times as many plants as on the same area of land where the seeds were planted twelve inches apart, and only about eleven times as many heads. It will, therefore, be seen that while the number of heads per acre decreased with the thinness of the seeding, that decrease is not nearly as great as the decrease in the number of seeds planted.

According to the results presented in column six, the highest average crop was produced by the plants which were planted in the six inch squares. These plants were about five inches taller than those which were planted in the inch squares, and about one and one-half inches taller than those which were planted in the twelve inch squares. It seems apparent that where the plants were a foot apart each way the stooling was so abundant that the energy of the plant was expended in the production of stools to the sacrifice of the length of the plants.

The results shown in the sixth column correspond, to a certain extent, with those in column five. It will be seen that the plants which lodged the most were those which were also the tallest, and were produced from the seeds which were planted six inches apart. It is interesting to notice that the very thickest seeding produced a crop which was lodged less than any of the other seedings. These results seem somewhat different from the popular conception that it is necessary to sow oats rather thinly so as to reduce the percentage of the lodging of the grain.

The average results of the per cent. of rust shown in column number eight are also very interesting, as they show a gradual increase in amount of rust on the straw of the oats from the thickest to the thinnest seedings. The plants from the thin seeding had about three times as much rust as those from the thick seeding. The amount of rust on the plants which were four inches apart was about average of that of the thinnest and the thickest seedings.

The average number of days from the time that the grain was planted until the plants were matured is presented in column nine. It will be seen that there is a difference of nine days from the time that the thickly seeded plants matured until the thinly seeded plants had ripened. The increase in the stage of maturity corresponds exactly with the increase in the distance between the plants. The farther the plants were apart the later they were in ripening. It will, therefore, be observed that as the amount of seed oats per acre is increased the stage of maturity of the crop is hastened.

The average results presented in column ten, although not as regular throughout as some of the other columns, are nevertheless just as interesting. It will be observed that the heaviest average weight per measured bushel was obtained from the crop which was sown in the three inch squares, and from this seeding there was a gradual decrease in weight per bushel as either the thickest or the thinnest seeding was approached. The lightest oats were produced from the thinnest seeding. It will be seen that a heavier weight of oats per bushel was obtained where one and one-third bushels of seed were used than when three bushels per acre or three pecks per acre were sown. Although the weight per measured bushel, even in the highest average, is less than the standard it must be remembered that at least two out of the four years in which this experiment was conducted the weather conditions were somewhat unfavorable for the production of oats of high quality in Ontario.

The combined yield of the straw and the chaff is presented in the eleventh column. These average results show us that for a large straw production it is

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necessary to sow oats comparatively thick. Even the land which was sown with oats at the rate of twelve bushels gave a greater yield of straw than the land which was sown with oats at the rate of three bushels per acre. With only a slight exception there is a gradual decrease in the yield of straw and chaff per acre from the thickest to the thinnest seedings. It is interesting to note, however, that three pounds of oats produced more than one-half the yield of straw as obtained from 414 pounds of oats as seed per acre.

In the last column, which may be considered as the most important of all, we find that the greatest yield of grain per acre was obtained from the oats which were sown three inches apart each way. From this yield there is a gradual decrease in yield per acre to both the thickest and the thinnest sowings. It is very interesting to note that the yield from three pecks per acre was four bushels greater than that from the crop obtained from sowing three bushels per acre. The results here presented favor rather thin seeding as against thick seeding in the production of oats.

Particular attention should be drawn to the fact that in the experiment as here conducted one and one-third bushels of seed per acre when placed in the land very evenly gave a greater yield of oats per acre, which weighed more per measured bushel than that obtained from either three bushels or from three pecks of seed per acre. The results presented in the above table are very suggestive, especially as forming a basis of other experiments which are to follow. In another year or two we expect to present the results of this and other experiments which we have under way in a more detailed manner. When this material is submitted we believe it will add a considerable amount of valuable information in regard to both the selection of seed and the stooling properties of oats, as they relate to crop production, in addition to the information furnished in regard to the thickness of seeding of this most important crop.

The Growing of Grain in Different Combinations for Grain Production.

Several experiments have been conducted in mixing grains in different proportions for the production of threshed grain. Many valuable results have been obtained. A number of these have already been presented in annual reports of past years. Other experiments are now under way. Some of them, however, have not been conducted for a sufficient length of time to report the results in detail, and in some of the others we have not had sufficient time to properly prepare the results for printing. The reports on these experiments will, therefore, be held over for publication in the future.

Varieties of Spring Barley.

According to the reports of the Bureau of Industries for Ontario there were 623,658 acres of barley in the Province in 1913. The total production was 17,295,811 bushels, or an average of 27.7 bushels per acre. This yield was two bushels per acre less than in 1912 but almost exactly equal to the average yield per acre for the past thirty years. The weather conditions in Ontario were quite unfavorable to a high production of barley over a considerable area of the province. The only small grains which are grown more extensively than barley in Ontario are oats and fall wheat, but in the latter case there is only a difference of about 23,000 acres. The barley crop is, therefore, exceedingly important in connection

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with the agriculture of the province. The yield of barley per acre in Ontario has been considerably increased in recent as compared with former years and this increase has undoubtedly been brought about to a considerable extent by the introduction of new varieties, such as the Mandscheuri at first and the O.A.C. No. 21 more recently. Barley as grown in the Experimental Department at Guelph, can be divided into three district classes, viz.,—the six-rowed, the two-rowed, and the hulless. These three classes differ from each other in several respects. As a rule the six-rowed barleys are early in maturing and give comparatively large yields of grain per acre. The two-rowed barleys not only differ from the six-rowed barleys in the nature of the head but they are, as a rule, later in reaching maturity and are somewhat less in grain production, although the grain in some instances weighs more per measured bushel than that of the six-rowed varieties. The hulless barleys have a standard weight per measured bushel of 60 instead of 48 pounds. The straw is usually short and somewhat inclined to lodge. The following table gives the average results of five years' experiments with each of twenty varieties of barley representing the three distinct classes, viz.,—six-rowed, two-rowed, and hulless.

RESULTS OF DIFFERENT VARIETIES OF BARLEY.

Classes and varieties.	Bearded or bald.	Color of grain.	Average height.	Per cent. of rust.	Days to reach maturity.	Weight per measured bushel.	Yield per acre 5 years.	
							Straw	Grain.
SIX-ROWED:			(inches)			(lbs.)	(tons)	(bus.)
Mandscheuri	Bearded	White	35	3	100	48.76	1.76	62.37
California Brewing	"	"	27	4	103	46.47	1.47	59.69
Oderbrucker	"	"	35	3	98	49.17	1.64	56.33
Zulu King	"	Black	26	6	99	48.95	1.45	53.53
Mensury	"	White	32	4	97	50.94	1.59	51.93
Common Six-rowed	"	"	33	3	97	49.33	1.61	50.54
Oregon	"	"	27	7	112	48.32	1.60	45.37
Success	Bald.	"	33	5	92	47.48	1.35	42.05
TWO-ROWED:								
Two-rowed King	Bearded	White	31	3	105	52.17	1.83	56.71
Imported No. 5591 (Iowa)	"	"	31	3	106	52.66	1.88	54.73
Hanna No. 5590 (Iowa)	"	"	31	3	106	52.96	1.85	54.68
Jarman's Selected Beardless	"	"	30	4	108	52.62	1.74	52.76
Duckbill	"	"	31	8	109	51.07	1.86	45.06
French Chevalier	"	"	31	6	113	51.44	1.93	43.96
Two-rowed Canadian	"	"	30	7	109	51.61	1.84	43.82
HULLESS:								
Guy Mayle	Bearded	Green	27	4	96	60.19	1.82	49.29
Black Hulless	"	Black	29	4	100	62.28	1.68	46.83
Purple	"	Purple	27	3	99	62.30	1.73	46.60
Winnipeg No. 2	"	White	27	3	100	59.18	1.87	44.89
New White Hulless	Bald	White	26	6	105	59.91	1.90	31.97

While the two-rowed barley is grown extensively in England, Germany and other European countries, it is surpassed in productiveness by the six-rowed varieties in nearly all cases in Ontario. In 1913 no less than forty-nine varieties, selections, and hybrid barleys were grown under competition in the experimental

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plots at the College. Many other varieties which have been grown in former years, and which had given comparatively low results, have been dropped from the list after five years' experiments. Even these, which still remain under experiment, show considerable variations both as regards the different classes and also the different varieties in each class.

Of the eight six-rowed varieties of barley which have been grown under competition in each of the past five years it will be seen that there was a difference in the average annual yield per acre of fully twenty bushels. The Mandscheuri which occupies the highest place in yield per acre has been a very prominent variety since its introduction by the College from Russia in 1889 and its distribution throughout Ontario a few years later. It has proven a most valuable variety not only for growing in Ontario as a distinct variety but as furnishing foundation material for selection and for cross-fertilization. It is from this variety that the O.A.C. No. 21 barley has originated. This important selection will be discussed by itself under a separate heading.

For nineteen years in succession the Mandscheuri barley was distributed throughout Ontario for co-operative experiments. In every year this variety was compared with one or two other leading varieties and the results were decidedly favorable to the Mandscheuri barley. From these small lots so distributed, the barley has increased over Ontario until it has been grown on upwards of one-half million acres in a single year. It was undoubtedly the most popular variety of barley grown in Ontario until the introduction of the O.A.C. No. 21 which is surpassing the Mandscheuri and which is now grown very extensively, its increase during the past few years being very rapid.

Each of four varieties of six-rowed barley has been grown at the College in each of the past twenty-four years, between 1890 and 1913 inclusively. The following table gives the yield per acre of each of these varieties of barley for 1890, which was the first year in which they were grown, and also the average yield per acre for each of the varieties for the twenty-four year period.

Varieties.	Yield per acre. 1890.	Average yield per acre. 24 years.
	Bus.	Bus.
Mandscheuri	51.9	69.4
Oderbrucker	47.2	62.9
Common Six-Rowed	41.7	59.9
Mensury	38.8	58.3

It will be seen that the average yield per acre for the twenty-four year period was considerably higher than the yield for the first year in which these barleys were grown. The highest yields per acre were produced in 1899, 1904, and in 1910. The detailed results show us that barley can be grown on the same land for a long period of time without deterioration of the crop, provided care is taken in the selection of seed and in the growing of the crop.

O. A. C. No. 21 Barley.

A knowledge of the history of barley growing in Ontario as influenced by the Ontario Agricultural College furnishes a strong argument for the existence of the College from merely a financial standpoint. The entire cost of the Institution has

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been far more than paid back to the province by the increase in the barley crop as the direct result of the improvement in the yield of barley through the distribution of better varieties obtained at the College through importation and through selection. As near as we can ascertain at the present time from 94 to 96 per cent. of all the barley which is now grown in the province belongs to the Mandscheuri and to the O.A.C. No. 21 varieties.

According to the report of the Bureau of Industries for Ontario the yield of barley per acre for the past fifteen years as compared with the fifteen years previous has had an increase of between 22 and 23 per cent. in yield per acre. The market value of the barley crop in Ontario in 1911, which is the last year for which we have a financial record, was $12,000,154.00. Twenty-two per cent. of this amount would be $2,640,033.00. This represents the annual increase in money value of the barley crop, owing almost entirely to the increase in yield per acre of the crop. The improved varieties of barley introduced has had a very marked influence in bringing about this increase. Two and one half million dollars per annum is a very large amount and represent about fifteen times the cost of maintenance of the College.

In the spring of 1903 selected grains of the Mandscheuri barley were planted by hand at equal distances apart in the experimental department of the College. These grains numbered between nine and ten thousand. This method gave an opportunity for each plant to show its individuality. When the plants were ripe they were carefully examined and thirty-three of the most promising ones were selected, harvested, and threshed separately. In 1904 these lots were sown separately in rows and these rows were carefully examined and the most important ones were harvested and threshed. From that time forward only the best strains were grown in the test, as follows: 14 in 1905, 8 in 1906, 7 in 1907, and 3 in each of the past six years. During the first year the different strains were known by separate numbers and the one which has proved to be the best is what is known as the O.A.C. No. 21.

The O.A.C. No. 21 barley possesses a good length of straw which is particularly strong in comparison with most other varieties of barley. The heads possess six rows of grain and are bearded. The grain is white on the outside but is of a bluish color immediately under the hull. So far the crop has been comparatively free from rust, the weight of the grain per measured bushel has been somewhat over the standard and the yield per acre has been heavy. In the experiments at the College, unfortunately, the comparative results between the Mandscheuri and the O.A.C. No. 21 could not be ascertained in the year 1910 owing to an oversight in the harvesting. In each of the past three years, however, the O.A.C. No. 21 has surpassed the Mandscheuri in yield of grain per acre, the difference in 1913 being 5.7 bushels per acre in favor of the O.A.C. No. 21 barley. This variety was distributed throughout Ontario in connection with the Experimental Union and has made a very excellent record. In each of four years in which it was compared with the Mandscheuri in the co-operative experiments throughout Ontario it surpassed the latter in yield of grain per acre, in freedom from rust, and in both length and strength of straw. From the one pound lots of the O.A.C. No. 21 barley which have been distributed through Ontario this variety has been increased very rapidly over the Province. In each of the past three years it has proven the most prominent variety in the competition of fields of standing grain in Ontario and in connection with our largest exhibitions with threshed grain. In fact the O.A.C. No. 21 has captured practically all of the prizes offered

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for six-rowed barley in the largest competitions in each of the past three years. Of all the barleys at the National Exhibition in the autumn of 1913, in which there were thirteen entries, there was no other exhibit except the O.A.C. No. 21 barley.

Varieties of Winter Barley.

Two varieties of winter barley were grown in the experimental plots in 1913, as in each of the five years previous. The average results of the six years' experiments show that the Wood's Winter barley gave an average of 42.9 and that the Tennessee Winter barley gave an average of 42.1 bushels of grain per acre.

One variety of winter barley has been grown at the College for twenty years. In each of three years it was badly winter-killed and in the other seventeen years it produced an average yield of 51.7 bushels of grain per acre which weighed on the average 47.9 pounds per measured bushel. In 1913 the yield per acre was 45.4 bushels and the weight per measured bushel 51.1 pounds. Winter barley is somewhat less hardy than winter wheat in Ontario.

Varieties of Oats.

The oat crop in Ontario is about as extensive as the crops of all other cereals combined. In 1913 there were 2,699,459 acres of oats in the Province and the average yield per acre was 35.3 bushels which was a rather low yield per acre for recent years. The oat crop is therefore an exceedingly important one in the Province of Ontario. The market value of this crop in recent years has given a range from thirty-five to over forty million dollars per annum. It will therefore be seen that a slight increase in the productiveness or in the quality of the oat crop in Ontario will exert a large influence in the value of this crop in the Province.

About three hundred varieties of oats have been carefully tested in the experimental grounds but many of these have been dropped after they have been grown for five years in succession, owing to the fact that other varieties have proven more successful. Each year a few new varieties are added and a few of the inferior ones are dropped. In 1913, one hundred and two varieties, selections, and hybrids were grown in competition in the experimental grounds. Of this number eight have been grown continuously for twenty-five years, thirty-three varieties continuously for five years, and the remainder are either selections or hybrids or have been grown for less than five years. The following gives the average yield of grain per acre of each of the eight varieties grown continuously for twenty-five years:—

Varieties.	Yield per acre. (bushels).
Siberian	91.2
Probsteier	87.2
Joanette	86.8
Oderbrucker	86.6
Waterloo	86.5
Bavarian	83.7
Egyptian	77.6
Black Tartarian	71.0

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It will be seen that there is an average difference of over twenty bushels per acre between the highest and the lowest yields of the eight varieties of oats grown under similar conditions in each of the twenty-five years.

The following table gives the average results for the last five year period of each of thirty-three named varieties of oats which have been under test continuously for that length of time.

RESULTS OF DIFFERENT VARIETIES OF OATS.

Varieties.	Per cent. Hull, 5 years.	Average Results for Five Years.						Yield of grain per acre.	
		Heads, mane, or spreading.	Days to mature.	Height.	Per cent. Rust.	Weight per measured bushel.	Straw per acre.	1913.	Average five years.
				ins.		lbs.	tons	bush.	bush.
O.A.C. Yellow Sixty-day	28.1	S	102	41	6	32.97	1.91	112.97	97.49
O.A.C. Yellow Kherson.	26.4	S	101	37	4	32.41	1.81	95.97	94.70
O.A.C. White Sixty-day	29.2	S	109	44	13	33.69	2.10	116.76	92.47
O.A.C. White Kherson..	27.9	S	109	43	14	33.80	2.15	113.71	88.96
Iowa Silver Mine.....	29.4	S	109	43	14	32.95	2.07	115.29	88.61
Prosperity	28.1	S	109	44	14	33.82	2.12	118.29	88.04
Siberian	29.4	S	109	41	9	32.51	1.84	107.50	87.78
Alaska	26.0	S	105	43	11	35.55	2.00	121.00	86.51
Minnesota No. 26.....	28.2	S	110	42	13	33.60	1.98	87.65	82.67
New Sensation	27.5	S	109	43	14	34.37	2.03	96.97	82.09
Abundance	28.1	S	109	42	14	34.21	1.93	112.65	81.80
Probsteier	28.0	S	109	41	11	33.98	1.88	90.21	80.92
Peerless	28.3	S	111	41	13	33.75	2.03	70.91	80.07
Pioneer	35.9	S	108	38	15	33.18	2.19	94.00	77.09
Kirsche's Most Prolific.	30.2	S	112	39	11	32.46	1.94	62.47	77.03
Burt	26.5	S	100	40	8	26.66	1.79	96.56	76.44
Great Dane(No.12,Gunson)	28.8	S	112	39	14	31.92	2.03	72.44	75.82
Ligowa	27.9	S	109	41	12	34.27	1.90	79.26	75.78
Joanette	24.0	S	107	37	8	32.86	2.07	94.85	75.45
Oderbrucker	30.4	S	110	41	14	33.24	2.04	75.09	73.83
Daubeney	25.1	S	103	39	7	35.52	1.71	60.41	72.87
Waterloo	27.4	S	111	41	11	32.26	2.06	74.94	72.33
Tartar King	32.9	M	109	44	13	34.29	1.98	94.18	72.14
Early Ripe	25.8	S	100	39	6	30.58	1.74	73.47	70.81
Liberty	29.3	S	112	40	12	33.10	1.79	65.29	70.33
Bavarian	28.3	S	111	40	9	33.51	2.14	75.50	69.65
Egyptian	31.2	M	110	42	14	34.49	2.20	83.03	69.27
Early Dawson	34.2	S	105	46	13	36.97	2.29	88.65	68.54
Storm King	33.6	M	109	40	16	33.34	1.99	75.50	66.34
Vick's American Banner	31.0	S	111	40	8	33.54	1.72	74.38	64.45
White Superior Scotch.	34.8	S	105	47	13	37.48	2.17	90.50	64.39
Black Tartarian	30.5	M	115	39	25	29.70	1.99	60.56	53.76
Hulless Oats	.....	S	109	45	9	.....	2.72	71.79	49.17

These results show even greater differences than those referred to in the table giving results for twenty-five years. Although many varieties have been dropped from the list, still those which are under test gave a wide range for selecting the variety of high productiveness. It will be seen that the Black Tartarian which was a common variety in Ontario twenty-five years ago has been surpassed in yield per acre by other varieties to an extent of over forty bushels per acre per annum. It is interesting to note that the four highest yielding oats are all either of the

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Sixty-Day or the Kherson strains. These two varieties, which are quite similar in their various characteristics, were carefully selected at the College and each of these selections has made a high record. The White selections which were taken from the Yellow oats vary somewhat in earliness as in each case the White oats are fully a week later than the Yellow. Outside of the earliness of the crop the characteristics of the White strains resemble those of the Yellow varieties. It will be seen, however, that in both cases the Yellow oats have surpassed the White ones in yield per acre. The Yellow Kherson, which is a yellow grain and which gives a light weight per measured bushel, is comparatively thin in the hull and is a heavy producer of grain.

Oats are very deceiving. The best variety for the farmer to grow on his farm is not necessarily the variety which takes the highest prize in the field crop competition, nor yet the variety which makes the highest record in the exhibit of threshed grain, nor yet the variety which occupies the highest place in both of these competitions. In order to find out the real value of an oat it is necessary to grow the different varieties under similar conditions and make a definite comparison of all the important characteristics. It is interesting to note that some of the varieties which stand the highest in both yield and quality of grain are not varieties which make a particularly good showing in the field or at the Exhibition. To back up this statement I would invite a careful study of the varieties as presented in the foregoing table and then carefully consider the varieties which are used in various competitions. According to our own investigations which extend over many years, we have found that, as a rule, those varieties of oats which weigh the most per measured bushel are light yielders and are of poor quality. I would invite the reader to make a careful study of the results presented in the accompanying table and see if the statement will not prove to be correct. It will be seen that the ten highest yielding varieties of oats possess grain which has less than thirty per cent. of hull, while the ten lowest yielding varieties include seven varieties which possess grain with a hull varying from 30.4 to 34.8 per cent. It will also be observed that of the ten highest yielding varieties only one has produced grain which in the average of the last five years has weighed upwards of the standard of thirty-four pounds per measured bushel, while of the ten lowest yielding varieties no less than four different kinds are over the standard in weight. There are only four varieties of mane oats included in the competition and these all occur amongst the twelve lowest yielding varieties. We have never yet found a particularly high yielding mane oat. These varieties of oats which have the mane or side heads usually appear well in the fields but are deceiving when threshed, the yields usually dropping rather lower than the appearance in the field would lead one to believe. The third column in the table gives the comparative earliness of the different varieties. In selecting oats to mix with a medium maturing barley, such as the Mandscheuri or the O. A. C. No. 21, in order that they may grow and ripen together it is necessary to select an early variety of oats. For this purpose, the Daubeney and the Alaska have given excellent results. The improved strains of the Sixty-Day and the Kherson varieties may prove important for this purpose. Attention, however, will be given to the O. A. C. No. 3 variety for this purpose in the following paragraphs, which will deal particularly with the O. A. C. No. 3 and the O. A. C. No. 72 varieties.

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O.A.C. No. 72 and O.A.C. No. 3 Varieties of Oats.

We have now two varieties of oats which we have originated at the College which are becoming so prominent, not only in our own results at Guelph, but also throughout Ontario that we are devoting a section of this report to a description and to the results of these new and most promising varieties.

It is possible that the O.A.C. No. 72 oats which was originated at the College through selection may take a somewhat similar position in oat production in Ontario as the O.A.C. No. 21 barley has in the barley production of the Province. In the spring of 1903 about ten thousand grains of the Siberian oats were planted separately at equal distances apart in a large nursery plot. This gave the separate plants an opportunity for development so as to bring out some knowledge of their individuality. When the grain was ripe the plants were all carefully examined and those possessing the most desirable characteristics were harvested separately and carefully stored. These selected plants were given a more critical examination in the plant breeding laboratory and those possessing the largest amount of the best seed were retained for future work. In the spring of 1904, a certain number of the seeds from each of the plants were planted by hand in separate rows which furnished an opportunity for a study of the characteristics of the progeny of the individual plants. A critical study was made of these different strains and only the best were continued in the test. As the result of this careful investigation it was found that what is now called the O.A.C. No. 72 seemed to possess the greatest combination of the most desirable characters. This variety has now been tested in the larger plots in each of the past seven years, the results of which are presented under this heading.

The O.A.C. No. 3 variety of oats originated from a single plant selected from the regular variety plot of the Daubeney oats in the year 1904. The writer at that time selected a number of plants which apparently combined the most desirable characteristics. These plants were threshed separately and the grain was carefully retained for future work. After careful tests were made it was found that the oat which now receives the name of O. A. C. No. 3 proved to be the best in combining some of the most desirable characters. The results of this particular strain are presented in comparison with those obtained from the O. A. C. No. 72 and from the American Banner, the last named variety being used for this purpose owing to the fact that it is the most extensively grown oat in Ontario at the present time.

The following table gives the average number of days to mature and the average yield of straw per acre in tons, as well as the annual and the average results in percentage of hull and in yield of grain per acre of the seven years' tests of the O.A.C. No. 3 and the O.A.C. No. 72 oats in comparison with the American Banner.

Varieties.	Days to mature.	Yield of straw per acre. tons.	Per cent. Hull.							
			1907	1908	1909	1910	1911	1912	1913	Aver.
Banner	111	1.90	28.3	28.6	29.6	29.6	31.3	35.5	29.2	**30.3**
O.A.C. No. 3	101	1.81	24.7	23.6	24.8	24.4	25.0	23.8	23.0	**24.2**
O.A.C. No. 72.....	111	2.17	27.2	25.4	28.7	28.6	27.8	28.0	25.6	**27.3**

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Varieties.	Yield of Grain per Acre (Bushels).							
	1907	1908	1909	1910	1911	1911	1913	Aver.
Banner	65.94	83.50	70.41	73.62	30.41	73.44	74.38	67.39
O.A.C. No. 3	86.29	89.24	104.88	90.35	49.76	91.65	94.12	86.61
O.A.C. No. 72	76.38	86.82	102.94	93.59	43.97	114.12	105.74	89.08

It will be seen from the foregoing table that in the average results of the seven years' experiments the Vick's American Banner and the O.A.C. No. 72 oats ripened at the same time, but the O.A.C. No. 3 variety is exactly ten days earlier. It will also be noticed from the average results that the O.A.C. No. 72 variety possesses a large amount of straw, giving fully one-quarter of a ton per acre per annum more than the Banner variety.

The detailed results show that in percentage of hull the Vick's American Banner was the highest and the O.A.C. No. 3 was the lowest in each of the seven seasons; the average for the O.A.C. No. 3 being 24.2, for the O.A.C. No. 72, 27.3, and for the Banner 30.3. It will therefore be seen that each one hundred pounds of O.A.C. No. 3 oats contains six pounds, and each one hundred pounds of the O.A.C. No. 72 oats contains three pounds of oat kernels or oatmeal more than the same weight of the Banner variety. The quality of oats is a factor which is too frequently ignored in oat production.

In yield of grain per acre the results are very striking. In every year the yields per acre of the O.A.C. No. 3 and of the O.A.C. No. 72 considerably surpassed the yield of the Banner. In the average of the seven years' experiments it will be seen that the Banner was surpassed by each of the other two varieties by upwards of nineteen bushels per acre per annum. The two new varieties, each of which were originated eleven years ago from a single seed, have certainly made excellent records in producing very large yields of grain of superior quality. In fact, the O.A.C. No. 3 variety of oats has proven to be better in quality than any of the other three hundred named varieties of oats which have been tested in the plots at the Ontario Agricultural College.

The O.A.C. No. 72 variety of oats was distributed in the spring of 1911 to three hundred Ontario farmers in connection with the regular co-operative work conducted through the medium of the Experimental Union. Each of these farmers sowed one pound of these oats on a plot one rod wide by two rods long in comparison with two or three other varieties. This new introduction did so well in the first year that many farmers saved their seed very carefully and sowed it on a larger plot in 1912. This seed was again carefully saved and sown on larger areas of land in the spring of the present year. In 1911, a young farmer in York County received the Experimental material and his father also received material for a similar experiment. These tests were made separately and reported in the autumn. The father then transferred to his son the product of the one pound of the O.A.C. No. 72 oats which he had received in the experiment. The son therefore had the product of two pounds of this variety of oats to sow in the spring of 1912. He obtained about ninety bushels. He sold three bushels of these oats for $25.00 and sowed the good seed of the remainder in the spring of the present year and obtained this season 3,300 bushels. We therefore see that one farmer obtained upwards of three thousand bushels of the O.A.C. No. 72

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oats in 1913 as the direct result of two pounds of this variety which were sown in the spring of 1911.

The O.A.C. No. 3 variety of oats was distributed to the co-operative experimenters through the medium of the Experimental Union in the spring of the present year. The reports of the co-operative experiments are now being obtained and a summary of the results will be presented at the Annual Meeting in January next, and will be printed in the next annual report of the Union.

Quality of Oats as Determined by the Amount of Hull.

The percentage of hull in oats is considered of so much importance that it is thought advisable to draw particular attention to the differences in this respect as shown by varieties; also to make an examination of the percentage of hull of the different varieties over a varied number of years to see whether or not the percentage of the different kinds remain relatively the same. The chemical composition of oats varies considerably and these variations are largely due to the percentage of hull found in the different varieties. We here present a table giving the exact percentage of hull of each of four varieties of oats as determined in each of twelve years and also the percentage of hull of each variety for the whole period.

Varieties.	Percentage Hull.												
	1902	1903	1904	1905	1906	1907	1908	1909	1910	1911	1912	1913	Average 12 years.
Joanette	22.5	23.1	22.5	24.0	25.2	23.4	23.9	25.4	23.9	23.9	24.3	22.4	23.7
Daubeney	26.1	25.1	23.0	26.3	26.3	24.7	23.8	25.4	24.9	26.2	24.6	24.5	25.1
Early Dawson	32.6	33.7	32.4	36.0	38.1	33.7	36.6	36.8	31.4	34.1	35.8	33.1	34.5
Pioneer	48.1	36.8	36.9	36.8	42.8	38.8	37.4	36.7	33.5	36.8	37.0	35.3	38.1

The results here given are very striking. The Joanette gave the lowest percentage of hull and the Pioneer the highest percentage of hull in all the years with one slight exception in each case. In fact, it will be seen that the percentage of hull increased in the order in which the four varieties are named in the table in each of the twelve years with only two or three slight exceptions. In the average results for the whole period the Pioneer variety of oats possessed 14.4 per cent. more hull than the Joanette variety. Oat hulls and straw are almost the same in chemical composition. The quality of the grain therefore of the Joanette oats is about fourteen per cent. better than that of the Pioneer, or in other words one hundred pounds of the Joanette would furnish about fourteen pounds of meal more than a similar quantity of grain of the Pioneer variety. Fourteen per cent. of the market value of the average oat crop of Ontario for the past five years would amount to over $5,000,000. The percentage of hull in oats has a much greater bearing on the real value of the oat crop of Ontario than many people realize.

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The Stooling Character of Oats.

The stooling of grain has been discussed considerably but the real investigational work in the study of the influence of stooling is apparently quite limited. It is only recently that we have given much attention to this characteristic of the cereal crops and the work which we have carried on so far has been confined largely to oats. While it is true that the stooling of the grains is influenced by the fertility of the soil, the conditions of the weather, etc., it is also true that it is influenced by the variety of the grain and by the thickness of the sowing. The fertility of the soil, the thickness of the sowing, and the varieties used are largely under the control of the farmer. In the results of our own experiments in each of the past four years the varieties of oats have shown very marked influences in stooling properties. We here present the five years' results of each of a number of varieties of oats which were sown under uniform conditions.

Varieties.	Number of Stools per Plant.					
	1909	1910	1911	1912	1913	Average
Joanette	21	18	15	26	16	19
Burt	22	13	17	19	18	18
Early Ripe	19	13	16	19	16	17
Yellow Kherson	19	13	15	18	15	16
Danbeney	18	11	14	14	12	14
Sixty-Day	17	12	13	14	10	13
American Banner	17	10	13	14	10	13
Siberian	14	12	11	12	9	12
Abundance (Regenerated)	11	10	11	14	10	11
Storm King	8	6	6	9	6	7
Tartar King	8	5	6	8	6	7

Great care was exercised in the sowing of the oats in this experiment, the seed being planted in squares one foot apart. In this way the plants had an opportunity for the development of stools and to bring out the characteristics of the individual varieties in this respect. It will be seen that there is a variation in the average number of stools, from seven in the case of the Tartar King to nineteen in the case of the Joanette. It will also be seen that the three lightest stooling varieties are the Tartar King, the Storm King, and the Regenerated Abundance, three varieties of oats brought from England to Canada by the Garton Brothers, of Warrington, England. The Abundance is a fairly good yielder, but both the Storm King and the Tartar King are light yielders of grain. The American Banner variety has furnished an average number of stools per plant which is exactly the average of the highest and the lowest stooling varieties. It is interesting to note that the average yield per acre of the two highest stooling varieties for the past five years has been seventy-six bushels per acre and that of the two lowest stooling varieties for the same period has been sixty-nine bushels per acre. It will therefore be seen that the highest stooling as compared with the lowest stooling varieties gave an average increase of seven bushels of oats per acre. We are gleaning some valuable information on the stooling of oats from another experiment which has been conducted in each of five years but cannot be reported at this time owing to the fact that the results of the crop have not as yet been completed in a manner suitable for publication.

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Wheats of Different Species.

In order to have an intelligent knowledge of the results of experiments with wheat it is necessary to know something of the botanical as well as the popular classification of this important grain. This being the case, it seems proper to indicate the different species of wheat which are usually given in the botanical classification. While authorities differ slightly in regard to the classification, the one which we here present is perhaps the simplest and the one which has been most frequently adopted.

As we have had representatives of all the seven species of wheat under experiment for at least five years it would add value to the classification to accompany it with actual results. As all of the different species are represented by spring varieties but are not completely represented by fall varieties it was thought advisable to furnish the results entirely from the spring wheats. As the standard weight per measured bushels is not the same for all the species, the results are given in pounds instead of bushels of grain per acre. The following table gives the common name and the scientific name of each of the seven species of wheat, and also the name and the average yield per acre for five years of the variety in each species which heads the list in yield of grain.

Name of Species.	Name of Highest Yielding Varieties.	Average Yield in pounds of Grain per Acre (5 years).
Common (*Triticum vulgare*)....	American Banner Winter Wheat...	2,604
	Saxonka Spring Wheat.....	1,956
Turgid or toulard (*T. turgidum*)..	Seven-Headed.....	1,548
Hard or Flinty (*T. durum*).....	Wild Goose.....	2,220
Polish (*T. polonicum*).....	Polish.....	1,146
Spelt (*T. spelta*).....	Red Spelt.....	2,019
Emmer (*T. dicoccum*).....	Common Emmer.....	2,813
One-Grained (*T. monococcum*).....	One-Grained Wheat.....	1,457

It should be explained that in the case of the first four species mentioned there is a clear separation of chaff and grain, and the weights here given are for the grain which has been separated from the chaff. In the case of the last three species, however, there is not a clear separation in the chaff and the grain and the weights given are therefore for the grain as it is threshed, which includes the chaff and which amounts to about twenty per cent. for the Emmer and thirty per cent. for the Spelt. The percentage of chaff in the One-Grained Wheat has not been determined for the five year period.

Of the seven different types of wheat here presented the one mentioned first in the list is possibly the most common in this Province. To this species belong the greater number of both the spring wheats and the winter wheats, some of which have bearded and others beardless heads. Some have red and others white chaff, and some are red wheats and in others the grain is classed as white or amber Such well known varieties as the Dawson's Golden Chaff Winter Wheat and the Red Fife Spring wheat belong to this type. The third species referred to in the foregoing list is represented in Ontario by the Wild Goose Spring Wheat which is grown extensively in many parts of the Province. Emmer is grown to a limited extent in some sections in Ontario under the name of Common Emmer, but in some sections the same grain is improperly called Spelt.

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The report on wheats will be presented according to a popular classification into which the wheats readily arrange themselves. The results will, therefore, be discussed under the following headings: Varieties of Winter Wheat, Varieties of Spring Wheat for flour production, Varieties of Macaroni Spring Wheat, Emmer and Spelt for the production of grain for feeding purposes, and Wheat of other species.

Varieties of Winter Wheat.

About two hundred and seventy-five varieties of winter wheat and also a large number of crosses and selections have been grown under experiment at the Agricultural College within the past twenty-four years. Nearly all the varieties have been carefully tested in each of five years, after which the inferior kinds have been discarded and those which have given the best results have been continued in the experiments. In the last year, eighty-six different lots of winter wheat were carefully tested under uniform conditions. These included thirty-nine named varieties, twenty-eight hybrids and a number of straight selections. Of the named varieties, fourteen have been grown in each of the past eighteen years, and the results of these are of special value.

Results of Varieties of Winter Wheat.

Variety.	Color of Grain.	Pounds per measured bushel 17 years.	Yield per Acre.		
			Bushels grain, 1913.	Average 18 years,	
				Tons Straw.	Bushels Grain.
Dawson's Golden Chaff	White	60.1	42.6	3.0	51.7
Imperial Amber.....	Red	61.0	40.1	3.2	47.7
Early Genesee Giant	White	60.3	38.9	3.1	47.1
Early Red Clawson.....	Red	59.0	37.9	2.9	46.3
Egyptian Amber	"	61.7	38.6	3.2	46.3
Rudy	"	61.5	39.7	2.7	45.0
Tasmania Red.....	"	61.9	38.1	2.9	43.7
Geneva.....	"	62.3	37.6	3.0	43.5
Kentucky Giant	"	61.2	39.1	2.8	43.4
Turkey Red,.....	"	61.3	36.2	2.8	42.9
Tuscan Island.....	"	61.1	36.6	2.9	42.9
Treadwell	White	60.2	34.8	2.8	42.0
Bulgarian	"	60.7	33.9	2.8	41.9
McPherson.....	Red	61.7	36.4	2.7	41.6

The average results of the fourteen varieties are as follows: yield of grain per acre, 37.9 bushels for 1913 and 44.7 bushels for the eighteen year period; yield of straw per acre, 2.2 tons in 1913 and 2.9 tons for the eighteen year period; and weight of grain per measured bushel, 62.7 lbs. for 1913 and 61 lbs. for the seventeen year period. These results show that in the experiments at the College for 1913 the winter wheat gave a yield of grain per acre and a yield of straw per acre slightly below the average of the past eighteen years. In weight of grain per measured bushel, however, the results for 1913 are somewhat higher than the average of the past seventeen years, the difference being 1.7 lbs. per measured bushel. In the last eighteen years the lowest average yields per acre of the fourteen varieties mentioned have been as follows: 20.2 bushels in 1912; 28.3 bushels in 1895; 32 bushels in 1908; and 34.1 bushels in 1904; and the highest

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yields have been as follows: 66.7 bushels in 1900; 61.6 bushels in 1902; and 60.5 bushels in 1903. In 1899 and in 1901 the results were so poor that no satisfactory tabulated returns could be made.

According to information obtained through different sources it was found that the Dawson's Golden Chaff winter wheat is still grown more extensively in Ontario than any other variety. It will be seen that it has given the highest yield of grain per acre of the fourteen varieties which have been grown at the College in each of the past eighteen years. It produces a very stiff straw of medium length, beardless heads with red chaff, and white grain which weighs slightly over the standard per measured bushel. It is probably safe to say that the Dawson's Golden Chaff, which was formerly quite soft, appears to be improving somewhat in quality for bread production. The Imperial Amber variety produces a large amount of straw which is medium in strength, a bearded head with red chaff, and a red grain of very good quality. The Early Genesee Giant has a compact bearded head, and a grain which is sometimes classed as white and sometimes amber. The Early Red Clawson variety has a comparatively weak straw and grain of poor quality. The Egyptian Amber winter wheat has a bearded head with white chaff, and a red grain of good milling quality.

Twenty-five varieties of winter wheat grown in 1913 have been under experiment for at least five years. In the five years' test, the highest average yields in bushels of grain per acre of the named varieties have been produced by the American Banner, 43.4; Dawson's Golden Chaff and American Wonder each 42.6; Crimean Red 41.2; Abundance 40.5; Michigan Amber 40.3; and Imperial Amber 40.1. The first three varieties named are of the Dawson's Golden Chaff type, and resemble each other closely in their various characteristics. The heaviest weights of grain in pounds per measured bushel in the five years' test have been produced by the Northwester, 62.7; Rudy 62.5; Egyptian Amber 62.3; Tasmania Red 62.1; Michigan Amber 61.9; and Geneva 61.9; and the lightest weights by the Gillespie White 58.3; and the Early Red Clawson 58.4.

In the average results of the five years' test, the Dawson's Golden Chaff and the American Wonder were the earliest to mature, the date being July 24th, and the Yaroslaf was the latest to mature, the date being July 29th.

In each of the past six years the varieties of winter wheat grown in the Experimental Department have been carefully tested for Bread production in the Bakery Branch of the Chemical Department at the College. The varieties of winter wheat which produced the largest loaves of bread from equal quantities of flour in the average of the tests made in the five years are as follows: Banatka, Crimean Red, Yaroslaf, Tuscan Island, Tasmania Red, Rudy, Egyptian Amber, Buda Pesth, Kentucky Giant, Treadwell, Bulgarian and Geneva.

Cross-bred Winter Wheat.

The plant breeding work at the College has included winter wheat as well as the other spring crops. A considerable amount of work has been done at the College during the last few years with the object of improving some of the best varieties of winter wheat by means of systematic selection and by cross-fertilization. The Dawson's Golden Chaff has been used extensively for crossing with such varieties as the Crimean Red, Tasmania Red, Buda Pesth, Imperial Amber and Turkey Red. In 1912, the highest yield of winter wheat obtained at the College was from one of the hybrids which we have originated, and in

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1913 the three highest yields of grain per acre were produced by three of the crosses between the Dawson's Golden Chaff and the Bulgarian, one giving a yield of 64.9, another 61.5, and still another 61.1 bushels per acre. All other plots of winter wheat, whether hybrids, selections or named varieties gave less than 60 bushels per acre. The highest yield per acre of all the named varieties was 55 bushels, which was produced by the "Wrinch's Volunteer," a wheat grown this year for the first time.

Varieties of Spring Wheat for Flour Production.

There appears to be a gradual decrease in the acreage of spring wheat grown in Ontario from year to year. There were 116,581 acres in 1913; 123,080 acres in 1912; and 359,531 acres per annum as the average for the past thirty years. The yield per acre of spring wheat in Ontario in 1913 was 1.3 bushels over the average. Some of the counties in Ontario, however, are still growing spring wheat quite extensively, especially the County of Renfrew in the eastern part, and the Counties of Ontario, Simcoe, York and Victoria, in the central section. The following table gives the average results of five years' experiments with each of twelve varieties of spring wheat grown under competition at the College:

Results of Varieties of Spring Wheat.

Varieties.	Bearded or Bald.	Color of Grain.	Average height.	Per cent. rust.	Days to reach maturity.	Weight per measured bushel.	Yield per acre.	
							Straw.	Grain.
			ins.			lbs.	tons	bush.
Saxonka	Be	Red	42	10	118	60.57	1.82	32.56
Red Fife	Ba	"	39	8	117	59.63	1.65	32.00
Climax	Be	"	41	8	117	60.39	1.82	31.87
Minnesota No. 163	Ba	"	39	7	117	59.60	1.71	30.95
Wellman Fife	Ba	"	40	8	118	59.78	1.71	30.43
Pringle's Champion	Be	"	41	8	118	61.19	1.66	30.14
Hungarian	Be	"	39	5	113	61.85	1.81	29.46
White Russian	Ba	"	39	8	117	59.92	1.72	29.33
White Fife	Ba	White	37	8	119	58.86	1.66	28.91
Red Fern	Be	Red	40	8	117	61.27	1.65	28.84
Herison Bearded	Be	"	40	7	118	62.09	1.73	27.30
Colorado	Be	"	40	7	114	60.80	1.52	26.64

The Red Fife variety which has been grown for a long time in Ontario and which is still grown very extensively in the Western Provinces, occupies second place in yield of grain per acre. It is surpassed by the Saxonka which gave an average of a little more than one-half bushel per acre more than the Red Fife. It will also be seen that the Saxonka produces a good yield of straw and grain which weighs well per measured bushel.

The Marquis variety of spring wheat which has been grown at the College in each of the past two years gave 41.2 bushels per acre in 1912 and 31.8 bushels per acre in 1913. The grain gave an average weight per measured bushel for the two years of 60.5 pounds. This variety of wheat was originated by Dr. William Saunders and was introduced by Dr. C. E. Saunders of the Central Experimental Farm, Ottawa. It is an early wheat and is giving particularly good results in some sections in the West. The Prelude also originated at the Central Experimental Farm, Ottawa, was grown in our trial grounds in 1913, for the first

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time. It was exceptionally early, reaching maturity in ninety-eight days from the time the seed was sown. This was earlier than any other variety of spring wheat which we had under experiment in 1913. The Prelude was seven days earlier than the Marquis and ten days earlier than the Red Fife. The yield of grain per acre, however, was comparatively light, with only 23.3 bushels. The only variety which gave a lighter yield per acre was the Polish which had a yield of 22.7 bushels per acre.

Varieties of Macaroni Spring Wheat.

At least three of the different species of wheat referred to under another heading are used for the manufacture of Macaroni. The hard or flinty wheat (*Triticum durum*), however, is the species which is principally used for this purpose. The wheats belonging to this type are frequently called the durum wheats and include the Wild Goose variety which has been extensively grown and is quite popular in many parts of Ontario. It is a very hard wheat and requires more power to grind it than the ordinary flour wheats. There is not a very clear separation of the bran from the flour, which usually has a yellowish color. It is understood that the Wild Goose wheat is used much more for flour production in Ontario than it was formerly, the flour being used to mix with that of other kinds of wheat.

Three varieties of macaroni or durum wheats have now been grown at the College under similar conditions in each of twenty-one years. The following table gives the average results of the weight per measured bushel, yield of straw and grain per acre for this long period.

Varieties.	Weight per measured bushel. (lbs.)	Yield per Acre.	
		Tons of Straw.	Bushels of Grain
Wild Goose	61.21	2.1	37.0
Medeah	59.91	2.1	33.3
Sorentina	59.44	2.1	31.9

It will be seen that the Wild Goose variety stands at the head of the list with an average of 37 bushels per acre per annum. This is nearly four bushels per acre per annum more than the next highest yielding variety. It will also be noticed that the Wild Goose gives a heavy weight per measured bushel, the average for the twenty-one years being 61.2 pounds.

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The following table gives the comparative results of each of six varieties of durum wheats grown for five years in succession.

Varieties.	Average Results for five years.				Average Results for 5 years.		
	Bearded or Bald.	Average height. (ins.)	Per cent. of rust.	Days to reach maturity.	Weight per measured bushel.	Yield of Straw per acre.	Yield of Grain per acre.
					lbs.	tons.	bus.
Roumania	Be	43	6	117	61.17	2.14	34.27
Arnautka (1537)	"	43	5	116	61.64	2.08	33.38
Wild Goose	"	43	12	118	59.28	2.17	32.64
Kubanka	"	44	8	116	61.16	2.08	31.76
Medeah	"	47	5	111	58.66	2.01	30.23
Sorentina	"	46	8	114	58.73	2.13	26.34

We notice here that the Wild Goose variety has been surpassed by two other varieties of durum wheats, viz., the Roumania which surpassed the Wild Goose by fully one and one-half bushels, and by the Arnautka which surpassed the Wild Goose by a little more than one-half bushel per acre per annum. The Wild Goose, the Medeah and the Sorentina occupy the same relative position in yield per acre in the five years' experiment as they do in the experiment extending over the period of twenty-one years.

Emmer and Spelt for the Production of Grain for Feeding Purposes.

We have under this heading varieties of spring wheat which represent two distinct types or species. One peculiarity of each of these two classes of wheat is the fact that in the process of threshing there is not a clear separation of the chaff from the grain. After the crop has been threshed the grain is still surrounded by the chaff and these two are ground together for the production of meal for feeding purposes. Although both Emmer and Spelt have been grown at the College more or less for over twenty years the last named grain is scarcely ever grown on the farms of Ontario. Emmer has been grown as a field crop in many sections, although it is frequently but improperly called Spelt. Each of these types of wheat is represented by a number of varieties. The following table gives the average of twelve years' results of each of three varieties of Emmer and three varieties of Spelt which have been grown at the College.

Classes of Crops.	Varieties.	Average Results for 12 years.			Weight per measured bushel. Average of 11 yrs.	Average Results for 12 years.	
		Per cent. rust.	Per cent. of crop lodged.	Per cent. of hull.		Straw per acre.	Grain per acre.
					lbs.	tons.	lbs.
Emmer	Common	3	27	20	39.7	2.0	2,813
	Russian	2	22	20	39.9	1.7	2,689
	Iowa	2	22	20	40.0	1.7	2,655
Spelt	Red	13	3	29	27.8	1.5	2,019
	Aistroum	15	3	29	27.8	1.5	2,006
	White	14	3	30	27.6	1.5	1,863

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Only a few years ago Emmer under the name of Spelt was advertised very extensively in Canada and in the United States and most extravagant claims were put forward for this grain. The results of the experiments at the College have had much to do in getting definite information in regard to the true names of these grains and their real worth as farm crops to be grown in Ontario. The results here presented are very interesting and bring out some striking differences in these two species of wheat. It will be seen that the three varieties of Spelt are much more subject to the attacks of rust than are the three varieties of Emmer. Again, it will be observed that the varieties of Emmer are more apt to lodge than the varieties of Spelt. In percentage of hull each of the Emmers has on the average of exactly twenty per cent. while the varieties of Spelt have from nine to ten per cent. more hull. In the average yield of grain per acre for the twelve years, the varieties of Emmer are decidedly superior to those of Spelt, the Common Emmer giving as high a yield as 2,813 pounds of grain per acre per annum. The Common Emmer forms a close rival to the best varieties of Barley and the best varieties of Oats for grain production in Ontario. It contains rather a larger percentage of hull than barley, but a considerably less percentage of hull than oats.

A Comparison of Four Species of Spring Wheat.

Year.	Red Fife (Triticum vulgare.)	Wild Goose (Triticum durum.)	Polish (Triticum polonicum).	Seven Headed (Triticum turgidum).
	Bushels.	Bushels.	Bushels.	Bushels.
1897	20.7	23.1	16.3	6.5
1898	34.2	48.3	27.1	24.7
1899	39.2	44.5	24.5	26.4
1900	46.3	48.4	34.5	39.4
1901	24.1	32.1	15.6	22.2
1902	31.9	33.5	29.1	25.0
1903	43.5	47.1	32.8	34.3
1904	22.2	47.1	20.1	33.2
1905	35.9	41.5	28.7	30.8
1906	33.9	36.0	19.5	28.2
1907	28.0	33.2	18.7	19.1
1908	36.3	25.6	23.8	24.5
1909	40.1	34.8	20.4	25.7
1910	44.0	49.2	30.6	37.5
1911	10.2	14.0	1.7	5.2
1912	29.1	32.5	20.2	28.9
1913	36.7	32.8	22.7	31.4

In order to give farmers reliable information in regard to some varieties of grain which have been extensively advertised and sold at high prices, experiments have been conducted and the results are being presented showing the actual returns of such wheats as the Polish and the Seven-Headed in comparison with standard varieties such as the Red Fife and the Wild Goose. Both the Polish and the Seven-Headed varieties of wheat have been advertised very extensively in both the United States and Canada. Another wheat known as the Alaska, which is very similar to the Seven-Headed, has also been advertised and sold at $20.00 per bushel. The Polish wheat was advertised a short time ago under the name of Corn Wheat and was also sold at an extravagant price. Of the seven types or species of wheat there is a clear separation of the grain and the chaff of four of these types when the grain is threshed. The table here presented gives the

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yield per acre for each of seventeen years of a leading variety of wheat, in each of four species in which the grain and the chaff are separated in the process of threshing.

It will be seen from a study of the foregoing table that the Wild Goose spring wheat has surpassed the Red Fife spring wheat in yield of grain per acre in each of the fourteen out of the seventeen years. It will also be seen that the Wild Goose has surpassed the Seven-Headed wheat in every year of the seventeen-year period, and also that the Seven-Headed wheat has surpassed the Polish variety in each of fourteen out of the seventeen years. It will be seen that it is not always the grain which is advertised the most extensively and which is sold at the highest prices which will give the most satisfactory results in the Province. The farmers are being protected through the results of experiments, and if they pay high prices for extravagantly advertised grain without studying the records of these grains they have themselves to blame.

Varieties of Rye.

There has been a rapid increase in rye cultivation in Ontario in recent years. This increase in seven years has amounted to 76 per cent., the acreage in each of the seven years being as follows: 1907, 67,158; 1908, 87,908; 1909, 94,661; 1910, 95,397; 1911, 98,652; 1912, 105,949; and 1913, 118,429. While the acreage of a number of other farm crops has been decreasing that of rye has been increasing in the Province. In 1913 the acreage of rye in Ontario has surpassed that of spring wheat for the first time in thirty years. The greatest acreage of rye grown in Ontario in any one year was 189,318 acres in the year 1902. From that year until 1907 there was a regular decrease, and from then to the present time, as we have already noted, an increase has taken place.

Varieties of Winter Rye. In each of the past ten years four varieties of winter rye have been under experiment at the College. The following average results in yield of grain per acre and in weight of grain per measured bushel have been obtained: Mammoth White, 58.7 bushels, 57.5 lbs.; Washington, 55.5 bushels, 57.7 lbs.; Thousand Fold, 53.4 bushels, 57.4 lbs.; and Common, 53.3 bushels and 57.0 lbs. Of the four kinds of rye here referred to, the Mammoth White variety gave the greatest yield per acre in each of seven out of ten years. In strength of straw, the Mammoth White and the Common varieties proved to be the strongest, and the Washington the weakest, although there was practically no lodging in 1913. The average height of the Mammoth White variety was about 72 inches in 1912, and 70 inches in 1913.

In each of the past two years a German variety of winter rye, known as the Petkus, has been grown in competition with the four varieties here referred to, and it has produced the greatest yield of grain per acre in each of these years.

Varieties of Spring Rye. For nine years in succession three varieties of spring rye have been grown under similar conditions at the College. As a rule the spring rye makes a shorter growth and gives a lighter yield of grain per acre than the winter varieties. It grows very rapidly, however, and is usually free from smut and from rust. The following table gives the average results for nine years of each of three varieties of spring rye:—

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Varieties.	Weight per measured bushel.	Straw per acre.	Grain per acre.
	lbs.	tons.	bushels.
Petkus	55.1	2.05	29.0
Common	54.8	1.97	26.1
Prolific Spring	54.8	1.91	25.9

It will be seen from the foregoing table that both the Prolific Spring Rye and the Common Spring Rye are surpassed in average yield per acre per annum by the Petkus Rye to the extent of fully three bushels. A small sample of this rye was obtained by the writer on his visit to Germany in 1901. It was obtained from the greatest rye breeder in Germany. It did poorly at first when grown in Ontario, but after the first three years it surpassed other varieties in each season with one slight exception.

O.A.C. No. 61 Rye.

From the Petkus variety of rye, which is a German variety, and which has been grown at the College since 1902, a number of the most promising plants were selected and these were tested out separately. From amongst these different strains one has proven of superior merit and has now been under cultivation in the experimental grounds in competition with the other varieties in each of six years, under the name of O.A.C. No. 61. In the average of the six years' experiments under uniform conditions, the following average annual yields per acre have been obtained from each of the four varieties: O.A.C. No. 61, 28.7 bushels; Petkus, 26.5 bushels; Common, 23.7 bushels; and Prolific Spring, 23.4 bushels. It will therefore be seen that the O.A.C. No. 61 has surpassed the Petkus, from which it was selected, by an annual average of two and one-fifth bushels per acre, and also that it has surpassed the Common Spring Rye by an average of five bushels per acre per annum. The O.A.C. No. 61 has also given a larger yield of straw than any of the other varieties, although the difference between the O.A.C. No. 61 and the Petkus is only slight.

Varieties of Buckwheat.

It is probably safe to say that no grain crop in Ontario has made as large a percentage of increase in acreage as has the buckwheat during the last few years. From the years 1882 until 1897 there was a gradual increase in the acreage of buckwheat in Ontario from 50,035 acres to 151,669 acres. From 1897, however, there was a gradual decrease for four years and the acreage went down to 88,266. From 1901 there has again been an increase until the present year, when the number of acres devoted to this crop in the province of Ontario has been 228,279, which is the greatest acreage given to this crop in Ontario in any one year of which we have any record. The following table gives the average results of nine years' experiments for each of five varieties of buckwheat:—

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RESULTS OF VARIETIES OF BUCKWHEAT.

Varieties.	Weight per measured bushel.	Yield of Straw per acre.	Yield of Grain per acre.
	lbs.	tons.	bus.
Rye Buckwheat	51.61	2.15	33.26
Common Grey.....	46.00	2.95	24.13
Japanese	44.43	2.95	23.25
Silver Hull.....	50.55	2.87	22.81
New Calcutta.....	48.52	3.04	22.01

The results are very striking and they show a difference of over 50 per cent. in yield of grain per acre of one variety over another in the average results for nine years. They also show that the Rye Buckwheat gave an average yield of at least nine bushels per acre per annum more than the next highest yielding variety. The results also bring out the fact that the Rye Buckwheat weighed more per measured bushel than any of the other varieties, surpassing the Silver Hull by fully one pound per bushel, and the Japanese variety by fully seven pounds per measured bushel. The Rye Buckwheat is grown considerably in certain parts of the Maritime Provinces. The flour of the Rye Buckwheat as compared with that of the other varieties has a yellowish color.

VARIETIES OF FIELD PEAS.

There has been a most decided decrease in the acreage of field peas in Ontario in the last four years. The number of acres devoted to this most important crop in Ontario amount to 403,414 in 1910, 304,491 in 1911, 221,524 in 1912, and 177,303 in 1913. This decrease is probably due to a considerable extent to the fact that for three years in succession the weather conditions were very unfavorable for the development of the pea crop in Ontario, as for instance, the yield per acre in 1910 was 14.9 bushels; in 1911, 14.7 bushels; and in 1912, 16.6 bushels. The average yield of peas per acre for the last thirty years has been 19.2 bushels, and the yield of peas in 1913 was 18 bushels, that for 1909 was 20 bushels, and that for 1907 was 21.6 bushels. It will, therefore, be seen that the yields of peas were not only much below the average in yield per acre, but were also decidedly lower than the yields obtained just previous, and just after this three-year period. We hope that the farmers of Ontario will not become discouraged and abandon this most important crop as there is still room and opportunity for the growth of peas as a valuable farm crop in this province. There is a good, strong demand for peas of a good quality. The writer frequently receives enquiries from buyers regretting the rapid decline of this crop for the last three or four years, and it is to be hoped that with more favorable seasons Ontario will again increase the acreage of the pea crop. The greatest acreage devoted to this crop in Ontario was in 1897, when there were 896,735 acres of peas grown in the province. From that year there was a decrease in the crop until 1903, when there were 407,133 acres. From then on the crop held its own very well until 1910, when there were 403,414 acres. It is true that the decrease in acreage of field peas in Ontario was due to a considerable extent to the ravages of the pea weevil (*Bruchus pisi*) in years past, but

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it appears as though the recent decrease in acreage has been brought about almost entirely by the unfavorable weather conditions.

The Ontario Agricultural College has given considerable attention to a careful study of the different varieties of peas in order that the farmers may have a reliable source of information as to the comparative value of the different kinds for growing in Ontario. In order to present these results in a fairly comprehensive way we shall submit two separate tables, one for a shorter and one for a longer period. The following table gives the average results of fourteen years' experiments with each of eight varieties of peas which have been under test:—

RESULTS OF VARIETIES OF FIELD PEAS FOR FOURTEEN YEARS.

Varieties.	Color of Grain.	Days to mature, average 17 years.	Length of vines, average 12 years.	Average results for 14 years.		
				Weight per measured bushel.	Straw per Acre.	Grain per Acre.
			ins.	lbs.	tons	bus.
Early Britain	Light Brown	104	38	57.29	1.38	37.00
Potter	White	105	43	59.43	1.41	34.92
Black Eyed Marrowfat	Smoky White	107	41	59.78	1.41	30.70
New Canadian Beauty	White	106	44	60.55	1.39	30.47
White Eyed Marrowfat	White	106	41	61.00	1.44	28.81
Prussian Blue	Bluish Green	109	43	60.19	1.59	27.59
Golden Vine	White	107	42	60.15	1.48	27.36
Multipliers	White	111	47	60.50	1.74	25.58

In the fourteen year experiment the Early Britain variety occupies the highest place in average yield of grain per acre. It will be seen that this variety has given an average of fully two bushels per acre per annum more than the next highest variety, and fully six bushels per acre per annum more than the third highest yielding variety. There is more difference in average yield of grain per acre between the first and the third varieties than there is between the third and eighth varieties. The Golden Vine and the Multipliers, which are quite well known over Ontario, occupy the lowest average yields of grain per acre. The Early Britain peas are of a brown color, and it was thought at one time that they would not be as saleable a pea as the white varieties, but Mr. Murton, who has a Split Pea factory at Guelph, informs the writer that the Early Britain variety is particularly suitable for the manufacture of split peas. He states that the manufactured product is of a rich yellowish color, and he would be greatly pleased if this variety of peas was extensively grown in Ontario, as it would meet with a strong demand at a good price.

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The following table gives the average results of each of twelve varieties of peas grown at the College for five years in succession:—

RESULTS OF VARIETIES OF FIELD PEAS FOR FIVE YEARS.

Varieties.	Color of Grain.	Days to mature, average 5 years.	Length of vines, average 5 years.	Average Results for 5 years.		
				Weight per measured bushel.	Yield of Straw per Acre.	Yield of Grain per Acre.
			ins.	lbs.	tons	bus.
No. 20,467 (Wash).....	Brown & Green	107	36	58.49	1.58	37.97
Potter.....	White	110	38	59.08	1.35	34.63
Early Britain	Light Brown	109	36	57.28	1.41	34.60
No. 12,887 (Wash	Brown	113	36	59.67	1.72	34.58
Black Eyed Marrowfat..	Smoky White	111	37	59.90	1.47	31.76
Clamart.....	White	103	37	58.26	1.14	31.41
Canadian Beauty	White	110	37	60.59	1.34	26.86
Golden Vine	White	112	40	60.34	1.61	25.68
White Wonder.....	White	100	16	59.68	.93	25.00
Prussian Blue	Bluish Green	113	35	60.53	1.56	23.83
White Marrowfat.....	White	109	38	61.73	1.29	23.48
Multipliers.....	White	118	42	60.61	1.73	20.41

It will be seen from these results that the Early Britain variety has been surpassed by a new variety of brown peas which were obtained through the Agricultural Department of the United States under No. 20,467. These peas are not as yet grown in Ontario except in our experimental plots. The Multipliers again come at the bottom of the list in yield per acre in the average of the five years' experiments, as was the case in the average of the experiments for fourteen years.

VARIETIES OF FIELD BEANS.

Varieties.	Average results for 14 years.	
	Weight per measured bushel.	Yield of grain per acre.
	lbs.	bus.
Pearce's Improved Tree.....	64.73	23.82
Scholfield Pea.....	65.16	22.28
Medium or Navy	64.95	21.26
White Wonder.....	64.94	21.13
Marrowfat.....	64.60	20.18
Small White Field	64.48	18.60
Large White Haricots	59.50	17.58

Although bean growing in Ontario has been confined largely to the Counties of Kent and Elgin the crop is grown to a limited extent in practically all the counties of the Province. The number of acres used for this crop in Ontario has been gradually increasing in recent years, and in 1913 there were 66,639 acres. Only in three other years was this acreage surpassed: viz., 1912, when there were 69,703 acres; 1895, when there were 72,747 acres; and in 1896, when there were 68,369 acres. In 1909 the crop was as low as 45,029 acres, in 1899 it was 40,485 acres, and in 1882 it was 19,789 acres. In 1913, twenty-two varieties and selections of beans were grown in the experimental grounds.

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The Pearce's Improved Tree Bean, which heads the list in the average yield of grain per acre for fourteeen years, is a white bean of medium size and of excellent quality. This variety has also given a higher yield of grain per acre than any of the other six varieties in the average results for the past five years. It will be seen that the Pearce's Improved Tree bean has surpassed the Small White Field bean of Ontario by an average yield of over five bushels per acre per annum for the fourteen year period.

Varieties of Soy or Soja Beans.

The Soy, Soja or Japanese beans have been grown in an experimental way in Ontario for many years. Seed of one or two of the best varieties have been distributed for co-operative experiments in the spring of the year for a number of seasons. Even the best varieties, however, have not as yet become very generally grown in Ontario. Many of the varieties which are grown in the United States are entirely too late to mature in this province. It is, therefore, of great importance to carry on systematic experimental work so as to know which varieties, if any, are most likely to give satisfactory results in general cultivation. The crop furnishes exceedingly rich feed for farm stock, and the plants may be cut and converted into silage, or they may be allowed to ripen for the production of grain. Upwards of thirty varieties have been under experiment at the College, but the most of these have proven to be unsuitable for cultivation in this climate. In 1913, sixteen varieties and selections of Soy beans were grown under similar conditions in the experimental grounds at Guelph. Of this number nine have been grown for five years in succession, and the following table gives the average number of pounds per measured bushel, and the average number of pounds of grain per acre:—

Results of Varieties of Soy Beans.

Varieties.	Average number of pounds per measured bushel.	Average number of pounds of grain per acre.
O. A. C., No. 81	57.9	831
Chernie, No. 18227	57.7	808
Buckshot, No. 17251	54.5	732
Habara, No. 20405	53.2	707
Early Yellow	57.2	691
Brown	57.8	662
Ito San	57.3	629
Tsurunoko	54.7	615
Akasaya	55.7	576

It will be seen that one of our own selections, started from a single plant, has given the highest average yield of seed per acre. This variety has also ripened more satisfactorily than many of the other varieties. It will be seen that the weight per measured bushel of the O.A.C. No. 81 is slightly higher than that of any other variety.

In 1913 seed of each of two varieties of Soy beans were obtained from Prof. Klinck, of the Macdonald College, Quebec. These were special strains resulting from selection at that institution, and one of them is known as Quebec No. 92,

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and the other as Quebec No. 537. The Quebec No. 92 gave 648 pounds of grain per acre which was surpassed only by two other varieties in the past year, viz., the Brown Soy bean, which gave 720 pounds, and the O.A.C. No. 81, which gave 664 pounds per acre.

Vetches for Seed Production.

Vetches have not been grown except to a very limited extent in Ontario for seed production, although one variety has been grown in a few places in the southern part of the province. The vetches are leguminous crops and furnish feed which is very rich in feeding quality. The Common Spring Vetches have been tested at Guelph, but have usually proven a failure from the standpoint of seed production.

Much has been written in recent years in regard to the value of Hairy Vetches as a valuable crop for Ontario, and particularly as a cover crop for orchards. As the seed is nearly all imported it is usually quite expensive, frequently costing from five to six dollars per bushel. Efforts have been made to ascertain whether the seed of this crop could not be grown successfully in Ontario. In experiments covering a period of twelve years in which Hairy Vetches were sown in the autumn for the production of seed the following year an average of 7.7 bushels of seed per acre has been obtained. In three of these years the yield has been upwards of 18 bushels, and in four other years less than two bushels per acre. In 1913 the crop was a failure owing to the fact that it was killed out in the winter and the early spring more than in any year during the entire experiment. The Hairy Vetches which have been grown at the College for several years have produced about 50 per cent. greater yields of seed per acre than the Hairy Vetches which have been imported more recently.

Some farmers are sowing a mixture of rye and vetches in the autumn with the idea of securing good seed of the vetches. The rye tends to keep the vetches from the ground and increase production of a good quality of seed. Occasionally Hairy Vetches are sown in the spring of the year for seed production, but the results are not nearly as satisfactory as those obtained from the autumn sowing. The yield of seed per acre from the spring seeding is not usually more than about one-half that of the autumn sowing.

Grass Peas.

Both for the production of grain and of fodder grass peas have been grown in Ontario for many years. At one time the crop was grown quite extensively in the southern part of the province, and threshed as a regular farm crop. The grain being ground into meal, and the rich meal was used in small quantities to increase the food constituents of a meal ration of other grains.

The grass pea is an annual legume. The stems of the plants are flat, and the whole crop is greatly relished by animals when used as a green fodder. The grain is angular in form, very hard, and is immune to the attacks of the pea weevil (*Bruchus pisi*).

In cool, wet summers the grass peas furnish a large amount of crop which can be used either as green fodder or as hay, and in drier seasons the crop is more suitable for grain production. In 1913 the yield of grass peas per acre was 1,672 pounds of threshed grain, while in 1912 the crop was practically a failure. In the average of the past six years, including 1912, the yield has been

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848 pounds per acre, and the average for the past nine years, also including 1912, was 753 pounds per acre. In comparison with this yield the Early Yellow Soy beans gave 791 pounds, and the Ito San Soy beans an average of 763 pounds per acre for the nine year period. A few of the seasons recently have been rather unfavorable to the best growth of the grass peas, and its production as a farm crop has decreased considerably.

Cow Peas.

Only two varieties of Cow Peas were grown in the experimental grounds during the past season. In former years, however, we have grown many varieties of the cow peas, but practically all have required too long a season for development, and the crop is usually a failure. The two varieties grown in 1913 were the Whip-poor-will cow peas and the Wonderful cow peas, and no seed was produced of either variety. Although much is said and written in regard to the value of the cow peas over the Southern States we must remember that the conditions in Ontario are quite different, and the farmers of Ontario should give their attention to those classes of farm crops which will prove the most suitable for their particular conditions.

Varieties of Flax for Seed Production.

Although flax is not grown very extensively in Ontario, and is not mentioned in the tabulated list of farm crops of the province, we observe amongst the comments that upwards of 12,000 acres are devoted to this crop, and that more than one-half is produced in the counties of Lambton, Huron, Bruce, Grey, and Wellington.

We have had under experiment at the College different strains of flax obtained from Russia, Holland, the Argentine Republic, the United States, and Manitoba, as well as from Ontario. In the results of the experiments for the past eight years we find that the highest results have been obtained from the Manitoba seed, which was followed by that obtained in Minnesota, known as Minnesota No. 25. The Manitoba flax, however, surpassed the Ontario flax by a comparatively small margin. In 1913 the highest results were obtained from the following varieties: Manitoba, 25.9; Ontario, 25.8; the Argentine, 22.8; and the Minnesota No. 25, 22.6 bushels per acre.

Varieties of Millet for Seed Production.

Millet sometimes forms an important crop in Ontario, more particularly to supplement the hay crop when it is found that there are poor prospects for a good crop of hay, therefore it is quite natural that in some years the crop is grown more extensively than in others. This will also explain how it is that the price of seed varies so much in the different years, as in some seasons there is almost no demand for the seed, while in other years the demand is heavy. The crop is, of course, grown for green fodder and for hay as well as for seed, but in this section of the report only the results of the experiments in seed production find a place.

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Twenty-one varieties and selections of millet were under test in the experimental grounds in 1913. Of this number seven varieties have been under experiment in each of ten years. The following table gives the average yield per acre of seed, and the weight per measured bushel for the ten years' experiment of each of seven varieties of millet:—

Varieties of Millet.	Average results for 10 years.	
	Weight per measured bushel.	Grain per acre.
	lbs.	bus.
Siberian	53.8	49.3
Steel Trust	54.5	45.7
Hungarian	53.7	42.8
Holy Terror Gold Mine	50.8	38.3
Golden Wonder	52.0	35.6
German or Golden	53.5	34.4
Common	54.1	33.8

It will be seen from the foregoing table that the Siberian millet has given an average yield of 15.5 bushels per acre per annum over the Common variety. The Siberian variety has uniformly produced high yields of seed per acre.

Of eleven varieties and selections of millets which have been under test for the last five years for seed production, a selection of the Siberian stands highest in the list with an average of 44.5 bushels per acre. The selection here referred to gave a yield of seed per acre of 52 bushels in 1913; 27.4 bushels in 1912; 40.6 bushels in 1911; 60.9 bushels in 1910, and 41.6 bushels in 1909.

Sunflowers for Seed Production.

Sunflowers have been discussed considerably, and the crop has been grown to a limited extent for the production of seed for feeding poultry, and for the production of heads for mixing with corn for filling the silo. Evidently but little work has been done, however, in the testing of the different varieties of sunflowers as crop producers at experiment stations in the United States, or in Canada other than at Guelph. A number of years ago seven varieties of sunflowers were obtained and grown under uniform conditions on our experimental grounds. In a short time some of these varieties were dropped, but those which have made the highest records have been continued in the experiment. The following table gives the average results of size of heads for thirteen years, the average height of the heads, the yield of both heads and of whole crop per acre for sixteen years, and the average yield of grain per acre for fifteen years:—

Varieties of Sunflowers.	Diameter. 25 heads. 13 years.	Average height. 16 years.	Average yield per acre.		
			Heads, 16 years.	Whole crop, 16 years.	Grain, 15 years.
	Inches.	Inches.	Tons.	Tons.	Bus.
1. Mammoth Russian	7.15	101	5.79	17.83	75.12
2. Black Giant	7.19	106	6.38	22.25	71.85
3. White Beauty	7.34	89	5.49	16.53	71.52

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As the standard weight per measured bushel of sunflower seed is twenty pounds, it will be seen that the Mammoth Russian variety has given an annual average yield per acre of 1,500 pounds. Although the Mammoth Russian variety gave the highest yield of seed per acre the Black Giant stands first in average yield of heads per acre, and also in yield of total crop. The White Beauty variety, which grows the shortest stalks, produces heads of the greatest size. The sunflowers are very hardy, and usually produce good returns when many of the other crops are almost failures.

Varieties of Corn for Grain Production.

According to the Report of the Bureau of Industries for Ontario there were 688,009 acres of corn in Ontario in 1913. Of this area 299,871 were used for the growing of corn for husking. It will, therefore, be seen that the production of corn as a grain crop is quite extensive in the Province of Ontario.

At the Ontario Agricultural College experiments have been conducted with a large number of varieties of corn, a number of which do not ripen sufficiently to obtain satisfactory yields of grain crops over a series of years. Some of the earlier varieties, however, practically always furnish grain which has been sufficiently matured to give satisfactory yields. It must be remembered that Guelph is 1,100 feet above the sea level, and that the climate is not influenced so much by water as is that of some of the counties located close to the lakes.

Results of Varieties of Corn for Grain.

Varieties.	Color of grain.	Average number of rows per ear.	Average results for 5 years.		Average results for 8 years.	
			Number of days until in full tassel.	Height of Plants.	Weight of freshly cut stalks and leaves.	Shelled grain per acre.
				ins,	(tons)	(bus.)
Early California Flint	Yellow	12	82	86	10.53	**57.19**
Wisconsin Little Dent	Yellow	14	78	86	6.93	**53.52**
Early White Cap Yellow Dent	Yellow	14	82	92	9.82	**51.75**
University, No. 13	Yellow	16	81	94	9.86	**50.91**
Longfellow	Yellow	8	82	91	12.20	**47.53**
Compton's Early	Yellow	12	85	93	12.42	**46.12**
Genesee Valley	Yellow	8	83	88	12.41	**45.26**
Red Blazed	Red and Yellow	8	81	92	11.04	**44.57**
Canada Yellow	Yellow	8	83	88	12.15	**41.68**
Sterling White Dent	White	14	86	93	10.40	**40.00**
Salzer's North Dakota	White	8	89	98	15.46	**36.32**

It will be seen that the Early California Flint corn, which is a yellow twelve-rowed variety, occupies the highest place in average yield of grain per acre in a series of experiments conducted for eight years. This is followed by three Dent varieties, and each of these four varieties have given an average upwards of fifty bushels of grain per acre per annum. The Canada Yellow, which is the old yellow corn of Ontario, gave an average of fully fifteen bushels per acre less than the Early California Flint. The Salzer's North Dakota came at the bottom of the

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list in yield of grain per acre. This is probably accounted for by the fact that it is a later maturing variety, and produces a larger total crop than any of the other varieties here reported. This variety does not mature sufficiently well at Guelph in all seasons to enable it to come out high in grain production. It is a corn rather more suitable for silage in the vicinity of Guelph and for grain production in the counties nearer the lakes.

Varieties of Sorghum for Seed.

Within the past few years we have tested upwards of thirty varieties of sorghum, both for the production of seed and of fodder. These include different varieties of broom corn, sugar cane, kaffir corn, Jerusalem corn, millo maize, etc. There are marked differences between the classes of sorghum, and also between the varieties of the different classes. The sugar canes, or more properly the sugar sorghums, contain a high percentage of sugar, while all of the other types of sorghum are non-saccharine. We have had eleven years' experience in growing some of the varieties of sorghum for seed production. Of these the broom corns have been the most productive, the Early Japanese, the Early Evergreen and the Early California coming the highest in yield of seed. Each of these has produced a yield of about twenty bushels per acre. In 1913, however, the yield was considerably below the average, the California Golden Broom corn coming the highest with 13.4 bushels per acre. The broom corns are grown more particularly for the production of the heads for the manufacture of brooms and whisks than for the production of either fodder or seed. Of the sugar sorghums, the Early Minnesota and the Early Amber have proven to be two of the very best. The Early Amber variety which has been grown successfully in Ontario for a number of years is the most prominent variety for cultivation in this Province. It is used for pasture, for green fodder, for dry fodder and for seed. The Sorghums appear to do particularly well on warm, rich, sandy loam. The Sorghums are sown and cultivated in a somewhat similar manner to that of corn, but the rows are usually placed a little closer together.

Potato Growing in Ontario.

Ontario is capable of producing a large quantity of potatoes of excellent quality. It is a crop, however, which has not varied greatly in acreage in Ontario in the last thirty years. The highest number of acres growing in any one year was 184,647 in the year 1895, and the lowest number of acres in any one year was 132,530 in 1905. In 1882 there were 160,700 acres, and in 1913, 167,707 acres. This shows a difference of only about 7,000 acres used for the potato crop in 1882 and 1913. One of the great reasons why more potatoes are not grown in Ontario is the scarcity of labor. Another reason may be found in the fact that there are so many different varieties of potatoes grown in the Province that it is practically impossible for buyers to go into any section of Ontario and secure car loads of uniform potatoes. As a result the Ontario farmers have to depend largely on their local markets, and the price per bushel is frequently less than potatoes from other Provinces where fewer varieties are grown, and where uniform samples are more easily obtained. The average yield of potatoes per acre in Ontario for the past thirty years has been 115 bushels, while that for the United States for the same length of time has been practically 81.5 bushels per acre per annum. It will, therefore, be seen that the average yield of potatoes per acre per annum obtained in

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Ontario for the last thirty years has been about 33.5 bushels greater than that of the United States, or an increase in Ontario of about 41 per cent. over that of the United States.

A large amount of experimental work has been conducted in potato growing at the Ontario Agricultural College, and the results have been presented from year to year in the Annual Reports of the College. In 1912 there was a considerable amount of rot in the potato crop at the College as well as throughout the greater part of the Province. In the crop of 1913, however, not a rotten potato was found. It might be well to very briefly again refer to a few of the varieties which were freest from rot in 1912, as there was a very marked difference in the different varieties in this respect. Those varieties of potatoes which showed the smallest percentage of rotten tubers at the time of harvest were as follows: Extra Early Eureka, 3 per cent.; Stray Beauty and Irish Cobbler each, 5 per cent.; Early Ohio, 6 per cent.; Pan American, 7 per cent.; and Early Fortune and Irish Cups each, 9 per cent. Those varieties which showed the highest percentage of rotten potatoes were as follows: Carman No. 1, 84 per cent.; Canadian Standard, 62 per cent.; Norcross, 61 per cent.; Uncle Sam, 58 per cent.; Eldorado, 54 per cent.; Crown Jewel, Vermont Gold Coin, and Rural New Yorker No. 2, each 48 per cent. Of the late potatoes which were freest from rot the Davies' Warrior, the Delaware and the American Wonder were amongst the best.

In 1913 the highest yields of potatoes per acre were obtained by the Extra Early Eureka, 268.8 bus.; Early Fortune 245 bus.; Irish Cups 242.5 bus.; Roger's Rose 240 bus.; and American Wonder 237.5 bus. The early potatoes did exceptionally well in the last year. The Davies' Warrior, which has given high yields per acre for the last few years, and which is a late potato, did not yield quite as heavily in 1913 as it had previously, the yield per acre for this year being 182.5 bushels. The Empire State, which is also a late potato, gave a yield this year of only 152.9 bushels per acre. Taking the average results for the last few years we find that the Extra Early Eureka has made the highest record of the early potatoes. The Burpee's Extra Early, and the Rose of the North are two of the leading medium ripening varieties, and the Davies' Warrior, the Empire State and the Rural New Yorker No. 2 are amongst the very best of the late or general crop varieties.

In an experiment which has been conducted at the College in each of five years it was found that the best treatment for checking the scab on the potatoes was to soak the seed potatoes for two hours in a solution of formalin made by mixing one pint of the forty per cent. formaldehyde with thirty gallons of water. This quantity of solution is sufficient for treating from fifteen to twenty bushels of potatoes. If only a few bushels of potatoes are to be treated a smaller amount of solution can be made by using lesser amounts of formaldehyde and water, and retaining the same proportion.

A number of other potato experiments were conducted in 1913 in spraying in different ways for the prevention of blight, in planting at different dates, in using seed of different stages of maturity, and in improving varieties by selection, etc. These results, however, require more time for preparation for publication than we are able to give them at present.

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Root Growing in Ontario.

In practically all kinds of field roots there has been a decrease in acreage in the past three years. We find from a study of the statistical reports of the Bureau of Industries for Ontario that there has been a gradual decrease in the acreage of turnips in Ontario since 1900, in which year there were 156,583 acres. In 1913 there were only 97,572 acres devoted to the turnip crop in this Province. The acreage devoted to the mangel crop reached its maximum in 1903 when there were 80,918 acres used for mangel growing in Ontario. The number of acres dropped to 69,035 two years later, and has almost held its own since that date, although in 1913 there were only 54,568 acres devoted to this crop. Within the past few years the area devoted to fodder corn has increased, and that devoted to the root crops has decreased. This may be accounted for principally from the fact that the spring work has been somewhat backward owing to the unfavorable weather conditions, to the scarcity of labor, and to the fact that some of the root seed, especially the mangel seed, has been only fair in germination. We rather expect that the mangel crop in Ontario will increase from year to year. The average number of acres per annum of mangels and sugar beets grown in Ontario in each of three ten year periods has been as follows: 1883-1892, 20,170; 1893-1902, 45,423; and 1903-1912, 81,836.

Varieties of Mangels.

The mangel crop in Ontario is an important one, amounting to about two and one-half million dollars annually. Mangels are classified into long, intermediate, tankard and globe according to their shape, and each class is represented by a number of varieties. Some of these varieties vary greatly not only in shape, but also in size and color. We have tested at the Ontario Agricultural College mangels under about one hundred and twenty different names. In some cases, however, the mangels under different names resemble one another so closely that they may be considered as the same variety, and yet there are frequent differences in purity of seed, in germination, and in productiveness even of these mangels, owing to the varying conditions under which the seed has been grown, harvested, stored, etc. It is very difficult, indeed, to get anything like a definite knowledge of the different varieties of mangels from the seedsmen's catalogues. It is exceedingly important to conduct experimental work in order that the different varieties may be grown and studied under uniform conditions. In the experimental work at Guelph we have found a great variation in the germination of the mangel seed, and during the past five years we have given this question very careful consideration and study. Mangel seed may be tested in the laboratory, and an estimation may be made in regard to the germinating power of the seed. For our own work, however, we have thought it best to make the germination tests in the field under normal conditions of soil, moisture, heat, etc. In order to obtain the most reliable information possible the experiment has been conducted with great care by planting definite numbers of mangel clusters of each variety in sufficient areas to make careful determinations. The experiment has been conducted two or three times each year by planting at different dates, and the experiment has been repeated in each of five years. Careful records are made of each of these tests in each of the seasons here referred to. We, therefore, present the average of five years' experiments, including in all fourteen district tests of the germination of mangel clusters of each of twenty-three strains and varieties:

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GERMINATION OF MANGEL SEED.

Varieties.	Percentage of Germination for 5 years (14 tests)					
	1909	1910	1911	1912	1913	Ave.
1. Steiger's Yellow Leutewitzer	66	158	212	95	65	119
2. Bruce's Gate Post Mammoth Long Red	103	109	202	125	40	116
3. Steele-Briggs' Prize Mammoth Long Red	34	130	219	112	60	111
4. Yellow Leviathan (O. A. C. grown seed)	142	90	137	27	137	107
5. Von Arnim's Criewener	110	112	180	54	61	103
6. Garton's Large Yellow Intermediate	99	95	179	73	53	100
7. Garton's Improved Yellow Globe	100	104	133	116	48	100
8. Sutton's Mammoth Long Red	50	108	168	92	69	97
9. Carter's Windsor Prize Taker Yellow Globe	52	119	133	113	69	97
10. Rennie's Perfection Mammoth Long Red	15	127	165	125	38	94
11. Steele-Briggs' Giant Yellow Intermediate	24	104	188	65	74	91
12. Sutton's Prize Winner Yellow Globe	49	89	160	98	58	91
13. Kirsche's Ideal	61	112	188	61	30	90
14. Ideal (Ontario Seed Co.)	174	83	114	95	75	90
15. Simmers' Mammoth Prize Long Red	45	118	169	81	31	89
16. Yellow Leviathan (Ferry)	84	101	129	55	65	87
17. Yellow Leviathan (Hewer)	68	101	138	55	66	86
18. Garton's Golden Tankard	99	41	162	67	39	82
19. Yellow Leviathan (Steele-Briggs)	85	96	116	46	59	80
20. Bruce's Mammoth Red Intermediate	76	77	96	85	63	79
21. Keith's Prize Taker	80	103	106	63	40	78
22. Yellow Leviathan (Rennie)	41	85	61	55	73	63
23. Yellow Globe Selected (Steele-Briggs)	16	15	114	82	52	56

The seed of each of the twenty-three varieties has been imported with the exception of that of No. 4, the Yellow Leviathan, which was grown at the Agricultural College in each of five years, and that of No. 14, the Ideal, which was grown by the Ontario Seed Company, Waterloo, Ontario, in each of four years, but the seed used in 1910 of this variety was imported. The seed of the Yellow Leviathan grown at the College in 1912 was not harvested until the 26th of September. A light frost occurred before this date, and evidently injured the mangel seed very seriously in that year causing it to give a lower germination than seed of the other varieties. A study of the results will show that in the average of the germination of the mangel seed for the five year period, by leaving out 1912, the College grown Yellow Leviathan mangel seed has given an average of 127 percentage of germination. If we take the germination for the same four years we find the average percentage to be 125 for the Steiger's Yellow Leutewitzer, 113 for the Bruce's Gate Post, Mammoth Long Red, and 111 for the Steele-Briggs' Prize Mammoth Long Red. It will, therefore, be seen that for those four years the College grown Yellow Leviathan mangel seed has given a higher percentage of germination than any other mangel seed which has been obtained from any source. It will also be noticed that the Yellow Leviathan mangel seed obtained from different seedsmen varies considerably in percentage of germination. The Yellow Leviathan mangel has made a high record at the College, and in the co-operative experiments throughout Ontario in the production of roots within the past eighteen years. It is to be hoped that the seedsmen of Ontario will be able to furnish the farmers of the Province with seed of this most important variety which will give a high percentage of germination.

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Varieties of Sugar Beets and Sugar Mangels.

Sugar beets are grown in Ontario for the production of sugar in the vicinity of the sugar beet factories at Berlin and at Wallaceburg, and to a limited extent in a few other districts. The sugar mangels, however, are grown more or less in various parts of the Province for the production of seed for farm stock. In 1913 there were slightly over 19,000 acres of sugar beets and sugar mangels grown in the Province. In 1907 the number of acres was 16,851, and in 1908, 17,453. Those varieties of sugar beets which have been bred extensively for sugar production usually give about 16 per cent. of sugar when grown in this country, while those which are raised more particularly for stock feed, and which are sometimes called Sugar Mangels, contain on an average only about 8 or 10 per cent. of sugar.

In 1913, nineteen varieties of sugar beets and sugar mangels were under experiment in the trial grounds at Guelph. The following table gives the average results in tons of roots per acre of each of sixteen varieties grown for a period of five years:

Results of Varieties of Sugar Beets and Sugar Mangels.

Varieties.	Length.		Yield per acre, 5 years.
	Above ground.	Below ground.	
	inches.	inches.	tons.
Tankard Cream	4.06	5.05	24.53
Bruce's Giant White Feeding	3.97	5.39	24.11
Rennie's Jumbo	3.96	4.67	23.08
Keith's Prize Winning Half Sugar	3.55	5.13	22.98
Steele-Briggs' Giant White	3.93	4.95	22.67
Rennie's Giant Half Sugar White	4.03	4.73	22.38
Rennie's Giant Sugar	3.57	5.55	20.42
Simmers' Imperial Giant Half Sugar	3.37	5.70	19.91
Bruce's Giant Rose Feeding	3.56	5.74	19.68
Rennie's Danish Improved	3.12	5.55	19.67
Darch & Hunter's Colossal White	2.73	5.35	18.99
Royal Giant (Steele-Briggs)	3.59	5.35	18.94
Rennie's Leviathan	3.09	4.55	17.98
Simmers' Improved Imperial	1.85	5.90	16.06
Kleinwanzlebener	.74	6.35	14.63
Simmers' White Silesian	.77	6.12	13.44

A variation in average yield of roots per acre per annum from 13.4 to 24.5 tons is seen from the results presented in the foregoing table. It will also be seen that there is a fairly close relationship between the yield of root per acre, and the amount of the roots which grow above the surface of the ground. The varieties giving the largest yields per acre are grown for feeding purposes, and are sometimes called the sugar mangels, while those near the bottom of the list are used more particularly for sugar production. The Kleinwanzlebener, which stands next to the bottom in yield per acre, is a variety of sugar beets which has been grown very extensively in the United States, and to a more limited extent in Canada for sugar production. This variety when grown in Ontario under proper conditions usually gives about fifteen or sixteen per cent. of sugar. Each of six varieties of sugar beets has been grown at the College in each of the past fourteen years, and the following are the average yields in tons of roots per acre per annum

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for the fourteen year period: Giant White Feeding 25.7; Royal Giant 22.2; Giant Rose Feeding 22.0; New Danish Improved 21.9; White Silesian 18.4; and Improved Imperial 16.8.

Varieties of Swede Turnips.

According to the reports of the Bureau of Industries no distinction is made between the swede turnips, and the soft or fall turnips. Those counties in Ontario in which the turnip crop is the most extensively cultivated are, Ontario, Wellington, Simcoe, Grey, York and Oxford, and in the order in which the counties are here named. The average yield of turnips per acre per annum in Ontario for the five years from 1907-1911 was 405 bushels, and for the thirty years from 1882-1911, 429 bushels. The following table gives the average yield per acre of each of eight varieties of swede turnips for a period of seven years:

Varieties of Swede Turnips.	Weight per root.	Yield of tops per acre.	Yield of roots per acre.
	lbs.	tons.	tons
Garton's Keepwell	1.77	7.50	19.91
Carter's Prize Winner	1.65	7.44	18.54
Good Luck (Steele-Briggs)	1.67	7.45	18.28
Carter's Invicta	1.65	7.69	18.00
Simmers' Defiance	1.54	6.95	17.39
Sutton's Magnum Bonum	1.58	7.59	17.33
Improved Hall's Westbury (J. A. Bruce)	1.53	7.03	17.11
Hartley's Bronze Top	1.48	7.17	16.43

The Garton's Keepwell, which heads the list in the yield of Swede turnips, is a comparatively new variety which has been tested at the College for only about eight years. The Hartley's Bronze Top, which was quite extensively grown in Ontario in years past occupies the lowest place on the list, and has given an average yield per acre per annum of three and one-half tons less than the Garton's Keepwell variety.

Three varieties of Swede turnips have been under test at the College in each of eleven years, and in this experiment of a longer period we find that the yields per acre per annum have resulted as follows: Hall's Westbury, 19.3 tons; Sutton's Magnum Bonum, 18.9 tons; and Hartley's Bronze Top, 17.7 tons.

Varieties of Fall Turnips.

The fall turnips, or as they are sometimes called soft turnips, are not grown very extensively in Ontario although we have no statistical reports in regard to the exact acreage of this crop in the Province. The fall turnips usually yield more heavily than the swede varieties, but they do not keep so well into the winter. Three varieties of fall turnips have been under experiment at the College in each of five years. The following gives the average yield of roots per acre: Red Top White Globe, 25.9 tons; Sutton's Imperial Green Globe, 22.9 tons; and Cow Horn, 19.5 tons.

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As two varieties of fall turnips have now been grown under experiment in each of the last twelve years the results for the long period of time should be exceptionally reliable as a general guide. From these results we find that the Red Top White Globe has given an average yield per acre per annum of 24.4 tons, and the Cow Horn variety of 19.8 tons. It will, therefore, be seen that in both the shorter and the longer term experiments the Red Top White Globe has occupied the highest place in yield per acre.

Varieties of Field Carrots.

Although there is not very much interest being taken in field carrots as a farm crop in Ontario we find that they are still grown to a limited extent in practically all of the counties of the Province. Those Counties which grow the greater quantities of field carrots are Carleton, Simcoe, Bruce, Lambton and York. The average yield of field carrots per acre in Ontario for the past thirty years has been 344 bushels. In 1913, thirteen different varieties and strains of carrots from home grown and imported seed were tested at the College. In the past year the Steele's Improved Short White gave the largest yield of roots, amounting to 19.8 tons per acre. The following table gives the average yield per acre of each of five varieties of field carrots for a period of fourteen years:

Varieties.	Color.	Length of roots.	Yield per acre.
		inches.	tons.
Steele-Briggs' Improved Short White.....	White	8.55	27.96
Mammoth Intermediate Smooth White.....	"	8.38	27.49
Simmers' Improved Giant Short White.....	"	8.33	26.51
Large White Belgian.....	"	10.90	24.26
Carter's Gate Post Orange Long.....	Yellow	8.97	22.08

The Steele-Brigg's Improved Short White which gave the highest yield of roots per acre in 1913, also occupies highest place in average yield of roots per acre for the long period of fourteen years. It will be seen that the three varieties occupying the highest yields per acre are all intermediate white varieties. Before the introduction of this type of carrot the Large White Belgian variety was grown in Ontario. This variety, however, produces long slender carrots which extend deep into the ground, and are very difficult to harvest. In addition to the large amount of labor required to harvest this variety, it will be seen that it has produced an average of fully three and one-half tons per acre per annum less than the Steele-Briggs' Improved Short White variety for the fourteen year period.

Varieties of Kohl Rabi.

Kohl Rabi is not grown extensively in Ontario, but in Europe it is grown rather more generally both as a vegetable and as a feed for stock, especially for sheep. The Kohl Rabi plants resemble cabbage in their root development, and swede turnips in the appearance of their leaves. The valuable part grows about three inches above ground in the form of a bulb. When grown as a food for sheep the crop is harvested and stored somewhat similar to mangels and turnips, although occasionally it is pastured off in the autumn.

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Several varieties of Kohl Rabi have been under experiment at the College, but the most of these have been dropped from the list. In 1913 three varieties were under test, the Early White Vienna giving the highest yield per acre, producing 13.8 tons. These same three varieties have been under experiment in each of twelve years, and the average yields in tons of roots per acre per annum have been as follows: Early White Vienna, 16.8; Earliest Erfurt, 16.6; and Goliath Purple, 14.8.

Varieties of Parsnips.

Enquiries have been received in regard to the comparative value of parsnips with other kinds of roots for feeding purposes. This class of roots has been used but little as a feed for farm stock. In order to glean some information regarding the amount of the relative yields of the parsnips in comparison with the other roots, experiments of a few varieties were undertaken at the College. All the varieties have been discarded from the list with the exception of two, which have now been under experiment in each of the past fourteen years. In 1913, the Ideal Hollow Crown gave 8.6 tons, and the Sutton's Cattle Parsnip, 7.8 tons per acre. In the average of the fourteen years each variety gave 10.9 tons of roots per acre. It will, therefore, be seen that the parsnips do not yield as heavily as the mangels, sugar beets, turnips, carrots or even the Kohl Rabi.

Varieties of Corn for the Silo or for Fodder.

The fodder corn crop in Ontario is increasing from year to year. In 1913, 388,138 acres were used for fodder corn; in 1912, 377,982; in 1911, 355,935; in 1910, 326,627; in 1909, 288,346; in 1908, 233,753; in 1907, 200,354; and in 1906, 180,796. It will therefore be seen that the area devoted to the growing of fodder corn in Ontario has more than doubled from 1906 to 1913. Previous to 1906, however, the number of acres used for fodder corn in Ontario varied from 91,403 in 1892, to 209,859 in 1902. These figures go to show that fodder corn is becoming a particularly important crop in Ontario as time advances. This increase has been made in spite of the scarcity of labor in Ontario and at a time when nearly all classes of field roots have been decreasing in acreage. Those counties in Ontario in which the greatest number of acres of fodder corn have been grown in the last two or three years are as follows: Oxford, Middlesex, Carleton, York, and Lambton.

As the fodder corn crop is such an important one in Ontario and as no one variety is suitable for all parts of the Province it is particularly important to conduct the experiments very carefully and to report the results in such a way that information may be gleaned which might form a general guide for the different sections of Ontario. While it is true that no one variety is best for all parts of the Province it is also true that in some localities in Ontario one variety would not be best for all of the farms in a single neighborhood, as the quality of the soil, the conditions of under-drainage, and other features of the farm are apt to vary considerably. It is therefore necessary for each farmer to take into consideration his own particular conditions in trying to select a corn which is likely to give satisfactory results on his own particular farm. It is also very important for the farmer to do a certain amount of experimental work for himself, and in connection with this work we are in a position to assist him considerably. It is well for each person to make a careful study of the experiments which have been conducted in

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the province as a basis for his own work. In this search for information he can obtain great assistance from results of experiments which have been conducted at our College at Guelph with a large number of varieties, in which information can be gleaned in regard to total yield per acre, yield of ears, stage of maturity, etc. The variety experiments conducted at the College serve as a general guide to the farmers in most parts of Ontario, indicating to them the kinds which are likely to be suitable for their respective requirements. The requirements of the various localities are so different that it seems necessary to give results which can be studied by individual farmers in order that the greatest value from the experiments may be obtained. We are, therefore, presenting the average of five years' experiments of each of forty-five varieties of corn which have been grown under uniform conditions. It must be remembered that a large number of varieties which have given only medium results have been already discarded from the list. The experiment each year was conducted in duplicate, so that we have the average of ten distinct tests made within the five year period. For each experiment the corn was usually planted during the last ten days in May and it was harvested about the middle of September. Immediately after the corn was cut the weight of the whole crop was taken after which the ears were husked, counted, weighed, and examined. The stage of maturity of the corn has been indicated by the condition of the corn at the time it was harvested. The seven terms which were used to describe the corn in regard to its ripeness were as follows: Water, Early Milk, Milk, Late Milk, Dough, Firm Dough, and Ripe.

As so much depends upon the source of the seed as well as upon the variety, we wish to draw particular attention to this phase of the work, and we are presenting the results in a general table of the White Cap Yellow Dent corn obtained from five different sources in Ontario, and in a separate table of the Longfellow and the Compton's Early varieties of corn obtained from Ontario and from the United States.

Corn Table No. 1 gives the average of the five years' experiment with each of forty-five varieties and strains of corn and the list is arranged according to the total yield of green crop per acre including the stalks, the leaves, and the ears, and table No. 2 gives detailed results for nine years of the Longfellow and the Compton's early varieties of corn, the seed of which was produced in Ontario and in the United States.

The detailed results of the ten distinct tests made with the varieties of corn in each of five years are worthy of very careful study and it is only by such a study of this table that the most valuable results can be obtained. An examination of table No. 1 will show that the corns are divided into three general classes, viz.: the dents, the flints, and the sweets. Many people imagine that the dent corns are heavy producers and rather late in maturing and that the flint varieties are lighter producers and earlier in maturing. A careful study of the table, however, will show that there are very marked exceptions to this rule. In fact the second highest yielding variety of corn in the average of the five years' results is a flint and and the second lowest yielding variety is a dent. Of the half dozen highest yielding varieties there are three dents, two flints, and one sweet, and of the lowest six yielding varieties there are three dents and three sweets. There are six dent

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FODDER CORN TABLE No. 1.

Varieties.	Description of Varieties.		Average Results of Five Years' Experiments—1909-13.					
	Class of Corn and Color of Grain.	Average number of rows per ear. 5 years.	Condition of Grain when harvested.	Number of days until in full tassel.	Height of Plants.	Weight per ear.	Yield per Acre.	
							Husked Ears.	Total Crop Green.
					Inches.	Ounces.	Tons.	Tons.
1. Eureka	Yellow Dent	16	Early Milk	102	116	6.30	2.17	21.10
2. Salzer's North Dakota	White Flint	8	Dough	89	98	6.15	3.41	19.21
3. Reid's Yellow Dent	Yellow Dent	16-18	Early Milk	96	111	6.10	2.58	18.16
4. Gold Nugget	Yellow Flint	8	Firm Dough	85	98	8.44	4.00	17.52
5. Mammoth Southern Sweet	White Dent	14-16	Early Milk	99	105	5.31	2.04	17.40
6. Stowell's Evergreen	Sweet	14-16	Milk	95	93	6.35	2.80	17.26
7. Primitive	Yellow Flint	12-14	Late Milk	98	97	5.78	2.90	16.80
8. Improved Leaming (Vick)	Yellow Dent	18	Milk	92	108	8.48	3.61	16.61
9. White Cap Yellow Dent (H. Smith)	Yellow Dent	16	Late Milk	88	105	9.27	3.82	16.30
10. Wisconsin No. 7	White Dent	14-16	Late Milk	88	99	8.20	3.69	16.29
11. Hoopengardner's Very Early Yellow Dent	Yellow Dent	16-18	Milk	90	106	8.54	3.77	16.25
12. Early Butler	Yellow Dent	14-16	Milk	90	107	7.21	3.24	16.18
13. Rennie's x x x Early Sweet	Sweet	12-14	Late Milk	88	82	7.57	4.03	16.09
14. Genesee Valley	Yellow Flint	8	Firm Dough	83	88	6.00	3.10	15.79
15. Simmer's Mammoth Eight-rowed	Yellow Flint	8	Firm Dough	84	89	5.67	3.08	15.74
16. Silver Triumph	White Flint	8	Firm Dough	83	93	6.44	3.36	15.69
17. Sanford	White Flint	8	Firm Dough	85	92	6.79	3.32	15.56
18. Compton's Early (Duke)	Yellow Flint	12	Firm Dough	85	93	7.37	3.66	15.52
19. Duke's Improved Sweet	Sweet	14	Milk	95	92	6.94	3.10	15.52
20. White Cap Yellow Dent (E. M. Zavitz)	Yellow Dent	14	Dough	84	102	8.60	3.82	15.32
21. White Cap Yellow Dent (Thomas)	Yellow Dent	14	Late Milk	85	98	7.89	3.54	15.12
22. Longfellow (Duke)	Yellow Flint	8	Firm Dough	82	91	6.41	3.11	15.12
23. Australian Extra Early Eight Rowed White	White Flint	8-12	Firm Dough	83	92	7.04	3.67	15.00
24. 90-day Red Flint	Colored Flint	8	Firm Dough	81	88	6.97	3.62	14.97
25. Canada Yellow	Yellow Flint	8	Firm Dough	83	88	6.28	3.05	14.90
26. Gibson's Choice	Yellow Dent	16	Late Milk	87	101	6.52	3.02	14.64
27. King Phillip (Duke)	Colored Flint	8	Firm Dough	82	91	6.53	3.21	14.63
28. Golden Glow or Wisconsin No. 12	Yellow Dent	16	Late Milk	83	97	8.19	3.84	14.35
29. Red Blazed	Colored Flint	8	Firm Dough	81	92	7.00	3.22	14.26
30. Leaming (Duke)	Yellow Dent	16	Milk	92	104	8.20	3.03	14.17
31. White Cap Yellow Dent (Dawson)	Yellow Dent	14	Late Milk	87	103	8.00	3.20	14.06

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32. Wisconsin No. 8	Yellow Dent	16	Dough	83	95	7.89	3.73	13.82
33. Early California Flint	Yellow Flint	12	Ripe	82	86	7.56	3.71	13.63
34. Sterling White Dent	White Dent	14	Dough	86	93	7.64	3.25	13.36
35. Duke's Improved Early White Cap	Yellow Dent	8–12	Firm Dough	81	92	7.17	2.98	13.36
36. Squaw Corn	Colored Flint	8–12	Ripe	81	87	6.57	3.26	13.24
37. University No. 13	Yellow Dent	16	Firm Dough	81	94	7.48	3.60	13.01
38. White Cap Yellow Dent (Hammond)	Yellow Dent	14	Dough	82	92	7.39	3.40	12.70
39. Early Strawberry (Martene)	Colored Dent	12	Ripe	82	79	7.77	3.67	12.52
40. Pearce's Early Evergreen	Sweet	12–16	Late Milk	79	76	7.43	4.08	11.80
41 Early Colorado Dent	Yellow Dent	8	Ripe	75	86	7.24	3.61	11.56
42. Mammoth White Cory	Sweet	8–10	Dough	76	65	5.70	3.45	11.08
43. Simmer's Earliest Ripe	White Dent	12	Firm Dough	82	79	6.46	3.04	10.51
44. Wisconsin Little Dent	Yellow Dent	14	Firm Dough	78	86	7.28	3.45	10.09
45. Golden Bantam	Sweet	8	Dough	76	58	3.65	2.43	7.51

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Corn Table No. 2.

Varieties.	Sources of Seed.	Average Results for 9 years.		Yield of Grain per Acre. Bushels by weight.										Total Yield of Green Crop per Acre. Tons.									
		No. of days until in full tassel.	Height of Plants (inches)	1905	1906	1907	1908	1909	1910	1911	1912	1913	Average nine years.	1905	1906	1907	1908	1909	1910	1911	1912	1913	Average nine years.
Longfellow	Ontario.	81	93	71.9	84.9	51.8	61.2	36.9	47.3	31.8	21.5	45.0	50.3	19.85	14.60	20.45	13.65	15.75	16.95	11.75	17.50	13.63	16.01
	United States	87	95	52.0	79.0	33.9	55.8	27.4	34.5	30.7	11.1	22.6	38.5	23.10	16.35	18.10	16.00	17.65	17.85	17.55	19.85	15.40	17.98
Compton's Early	Ontario.	85	98	70.8	73.5	50.0	63.4	31.9	43.0	42.0	23.6	41.6	48.9	22.15	15.75	22.60	16.85	15.55	16.00	16.20	17.40	12.45	17.22
	United States	86	99	55.2	88.4	38.4	50.0	29.2	51.4	41.1	18.6	34.7	45.2	22.00	16.75	18.65	16.45	15.45	15.60	16.25	19.85	16.75	17.53

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varieties which have given a lower average yield of total crop per acre than the lowest flint variety which is recorded. Again, it will be noticed that the Salzer's North Dakota corn produced grain which reached the dough condition and gave an average yield of 19.2 tons per acre, and the Hammond's White Cap Yellow Dent produced grain which also reached the dough condition but which produced only 12.7 tons per acre. The four highest yielding varieties of corn have produced grain which has reached three different stages of maturity. The Eureka and the Reid's Yellow Dent have been in the early milk stage, the Salzer's North Dakota has reached the dough condition, and the Gold Nugget has reached the firm dough stage. It will be noticed that there are only four varieties of corn in the list which we have indicated as perfectly ripe. Probably what we term firm dough would be generally spoken of as ripe by many of the farmers. In considering the maturity of the corn it is well to study the number of days from planting until the corn is in full tassel. It will be seen that the Eureka requires 102 days, the Gold Nugget 85 days, and the Early Colorado Dent 75 days to reach the full tasselling stage. The Eureka produced the tallest stalks, 116 inches, and the Golden Bantam the shortest stalks, 58 inches. There seems to be but slight relation between the yield of ears and of whole crop per acre. The highest yields of ears were produced by the varieties which occupy thirteenth and fortieth places in total crop and the lowest yields by varieties which occupy fifth and first places in total yield per acre. One of the reasons why the high yielding varieties have produced a small quantity of ears is the fact that they were so immature at the time of harvest.

Particular attention is drawn to the fact that there is not only a marked difference in the varieties but also that there is a decided difference in the results of the same varieties obtained from different sources. In connection with this consideration the attention of the reader is directed to the results obtained from the White Cap Yellow Dent corn secured from five different sources and reported in the first table. The White Cap Yellow Dent obtained from H. Smith, Essex County, is fifth on the list, and that obtained from J. Hammond, also from Essex County, is thirty-eighth in the list in yield of total crop. The White Cap Yellow Dent obtained from Zavitz, of Middlesex County and from Thomas, of Essex County, occupies an intermediate place in production of total crop. These differences have been brought about through selection by the growers. Naturally, each man would select according to his own desire and through selection in this way we find that there is a great difference in the various strains of the White Cap Yellow Dent.

In corn table No. 2 a comparison is made between home grown seed and seed which has been grown farther south in the United States, as illustrated by the results of the Longfellow and the Compton's Early varieties of corn in a series of nine years' experiments. It might be stated that the Ontario grown seed was produced in Essex County but it is not known in what parts of the United States the Longfellow and the Compton's Early varieties were grown as these lots were obtained through the seed trade. An examination of the table will show that there is a very marked difference in the crops produced from seed obtained from the different sources. Without a single exception the Longfellow corn grown from Ontario seed produced a greater yield of grain per acre and with only one exception a lighter yield of total crop per acre than the crop produced from the seed grown in the United States. The average results for the nine years show that the Ontario grown seed surpassed the American seed by 11.8 bushels of grain per acre

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per annum, and that the American seed surpassed the Ontario seed in the production of total crop by practically two tons of green crop per acre per annum. The results of the Compton's Early are about the same comparatively, but the differences are, as a rule, less marked than those of the Longfellow.

It will, therefore, be seen that for growing corn for the silo or for fodder, as well as for growing corn for grain, it is important not only to secure the best varieties but also to secure the best strains of the best varieties.

Varieties of Sorghum for Fodder.

Sorghums are grown for fodder purposes quite extensively in some of the States of the American Union and to a more limited extent in Ontario. The term Sorghum is a comprehensive one and includes a number of different classes of crops such as sugar cane, broom corn, and Kaffir corn, etc. The sugar canes, or more strictly the sugar sorghums, are used for fodder purposes in Ontario more than any of the other classes of sorghums.

For the best results from the sorghums the crop should be grown on rich loams or sandy loams. The sorghums usually thrive well in comparatively dry seasons. Experiments have been conducted at Guelph in testing different varieties of sorghum not only for seed production but also from the standpoint of production of green fodder. The Early Amber sorghum has also been used quite extensively in a pasture mixture. For the production of fodder eleven varieties were under experiment in 1913. Of this number six varieties have been grown under similar conditions in each of fifteen years. The seed was planted each year in about the same way as corn except that it was planted somewhat closer together. Three plants were allowed to remain in each hole and the holes were about twenty-seven inches apart each way. The seed was planted to a depth of about three-quarters of an inch. In 1912 a change was made in the method of planting, by the seed being placed in rows twenty-six inches apart and ten inches apart in the rows. One plant was allowed to remain in each place. In each year the sorghum received cultivation throughout as required. The experiment was conducted in duplicate in the past season. The following table gives the average results of each of six varieties for 1913 and also the average results for the past fifteen years.

Results of Varieties of Sorghum.

Varieties.	Height.		Yield of heads per acre.		Total Yield per acre.	
	1913.	Average 15 years 1899-1913.	1913.	Average 15 years 1899-1913.	1913.	Average 15 years 1899-1913.
	ins.	ins.	tons.	tons.	tons.	tons.
Orange Sugar Cane	69	88	.20	.33	7.90	**17.15**
Early Minnesota Sugar Cane	87	104	.73	.75	9.78	**16.69**
Early Amber Sugar Cane	73	94	.43	.89	8.50	**15.08**
California Golden Broom Corn	84	108	1.05	1.37	5.90	**10.78**
Early Japanese Broom Corn	82	104	1.19	1.36	7.15	**9.71**
Improved Evergreen Broom Corn	84	105	.66	1.26	4.65	**9.28**

The foregoing results indicate that sorghum, when grown in Ontario, produces a comparatively large yield of green crop per acre. The average yields of

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the highest producers amongst the sorghums are greater than those of about two-thirds of the varieties of corn, the results of which have been presented in an earlier part of this report. The Early Amber sorghum has produced a little more than fifteen tons of green crop per acre in the fifteen year period, although in 1913 the yield per acre of each of the sorghums was less than ten tons. It will be seen that the Early Amber Sugar Cane has produced a greater weight of heads than either of the other two sugar canes, the average yield being almost three times as great as that of the Orange Sugar Cane. Of the three varieties of sugar cane the Early Minnesota produces the tallest plants, the Early Amber the most seed and the Orange the largest amount of green fodder.

In each of the past three years an interesting experiment has been conducted in our experimental grounds to ascertain the comparative value of seed obtained from different plants of the Early Amber Sugar Cane. In 1911 it was found that there was a difference not only in germination but also in height of plants, in character of growth, in earliness, and in maturity. In 1912 the experiment was repeated with five of the same strains which we used in 1911 and also the seed of twelve additional plants. The results for 1912 showed that there was a variation in yield of crop per acre from 7.5 tons to 11.3 tons of green fodder and from three-fifths of a ton to one and one-third tons of heads per acre. In 1913 an experiment was conducted by planting the seed from ten distinct plants of sorghum, the seed being collected at three different times and under different conditions, and also from ten separate heads from each of two different farms. The results show considerable variations and indicate the fact that we have entered upon an important line of investigation in regard to the improvement of sorghum and the best time to secure the seed for the very best results. Sufficient evidence, however, has not as yet been obtained to enable us to publish results in detail.

Varieties of Millet for Fodder Production.

The production of millet for fodder growing in Ontario varies considerably in different years, owing to the fact that it is used largely as a supplementary crop. If the crop of hay is likely to be short a considerable amount of millet is sometimes sown, while if the hay production is likely to be plentiful the amount of millet sown is usually very limited. In some seasons when the spring opens early and the grains, potatoes, corn, and roots are sown and planted at the proper time, the remaining land available for the sowing of millet is often comparatively small, while in other seasons if the spring is late and cold and the usual quantities of potatoes, corn, and roots have not been planted, there is a good opportunity for sowing millet as a green fodder or a hay crop at just a time when the millet is likely to give the best returns.

Twenty-one varieties and selections of millet were sown in the experimental plots at Guelph in 1913. Seven of these have been under experiment at the College in each of eighteen years; fourteen in each of five years or more; eighteen at least four years; and twenty for three years or more. One variety was grown in 1913 for the first time. Of the seven varieties grown for eighteen years the highest yields of hay per acre per annum were as follows: Japanese Panicle 4.4 tons; Holy Terror Gold Mine 4.2 tons; Golden Wonder 4.00 tons; Japanese Barnyard 3.5 tons; and Hungarian Grass 3.4 tons.

The following table gives the results of each of eleven varieties of millets for 1913 and for the average of five years:

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RESULTS OF VARIETIES OF MILLETS.

Varieties.	Height.		Yield per acre.			
			Green Fodder.		Hay.	
	1913.	Average 5 years, 1909-1913.	1913.	Average 5 years, 1909-1913.	1913.	Average 5 years, 1909-1913.
	ins.	ins.	tons.	tons.	tons.	tons.
1. Japanese Panicle	32	36	9.55	8.98	3.90	3.94
2. Early Foxtail (75 Nichi)	26	33	7.25	7.86	3.48	3.51
3. Holy Terror Gold Mine	31	33	9.35	8.14	4.20	3.49
4. Siberian	25	30	8.55	7.52	3.95	3.32
5. Steele Trust	25	31	8.25	7.70	3.63	3.29
6. Golden Wonder	24	30	8.40	7.43	3.85	3.23
7. Hungarian Grass	28	32	7.00	7.01	3.35	3.20
8. German on Golden	32	33	6.85	6.78	3.38	3.00
9. Japanese Barnyard	31	36	4.85	7.36	1.95	2.98
10. Common	31	33	6.35	6.75	3.25	2.97
11. Japanese Barnyard (Minami)	27	31	4.75	7.57	1.90	2.96

The Japanese Panicle variety of millet was not only the highest in yield per acre of the seven varieties for the eighteen year period, but it also occupies highest place of the eleven varieties in the five year period. The Japanese Panicle variety of millet was brought from Japan by Professor Brooks of the Agricultural College at Amherst, Mass. Prof. Brooks had occupied a position on the staff of an Agricultural College in Japan for seven years previous to his return to the United States. He brought with him three varieties of millets representing three types, viz.: Japanese Panicle, Japanese Barnyard, and Japanese Common. The Japanese Panicle millet produces plants of an upright growth, a spreading head, and a large leaf development. The crop usually stands up well and is very productive. The seed of the Japanese Panicle variety is smooth, shiny, and of a dark brownish color. In ordering seed of the Japanese Panicle millet from the seedsmen great care should be taken to make the order very distinct or it is quite probable that the Japanese Barnyard variety will be forwarded. In some of the seedsmen's catalogue they have described the Japanese Barnyard millet and have illustrated the Japanese Panicle variety. Most of the seedsmen, however, have corrected this peculiar error and now have their illustration and their description consistent with each other. The two millets are entirely different in appearance and have produced results which vary considerably, the Japanese Barnyard coming near the bottom and the Japanese Panicle variety at the top of the list in yield of green crop and yield of hay per acre in the average results. When a quantity of seed of the Japanese Panicle millet is desired it is wise to obtain a sample and to examine it carefully to ascertain whether or not it is the true Japanese Panicle variety, before ordering a larger quantity. The Japanese Panicle and the Japanese Barnyard millets not only represent different varieties but actually different species.

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Sowing Millets Under Different Dates.

For six years in succession an experiment was conducted in sowing Japanese Panicle and Japanese Barnyard varieties of millet and Hungarian Grass on May 15th, June 1st, June 15th, July 1st, July 15th, and August 1st. The average results for the whole six years show that the highest yields in tons of green crop per acre per annum were obtained in every case from the seedings of June 1st.

Varieties of Sunflowers for Fodder.

Sunflowers have been grown for fodder production in Ontario to a limited extent. Their principal use has been for the production of sunflower heads for mixing with corn for the silo, but it is probably safe to say that only a few farmers have grown the crop for this purpose. Seven different varieties were at first included in an experiment at the College, but after a few years all were dropped but three kinds. Each of these three varieties have now been under experiment for sixteen years, and the following are the average results per annum in height of plants, yield of heads per acre, and yield of whole crop per acre: Black Giant, 106 inches, 6.4 tons, and 22.3 tons; Mammoth Russian, 101 inches, 5.8 tons, and 17.8 tons; and White Beauty, 89 inches, 5.5 tons, and 16.5 tons.

Varieties of Rape, Cow Cabbage and Kale.

About 45,000 acres are devoted to the growing of rape in Ontario each year. This acreage is about twelve times as great as that used for carrots, about two-thirds as great as for mangels, and two-fifths as large as that used for the cultivation of turnips. Fully one-half of the rape grown in this province is confined to the counties of Grey, Dufferin, and Wellington. The Dwarf Essex variety is the one which is used more extensively than all of the other varieties. The rape plant resembles the swede turnip in its leaf, and the cabbage in its root. It is the leaf and the stem which furnishes the valuable portion for feeding to live stock. Rape makes an excellent late summer and autumn crop for fattening cattle, sheep and lambs, for which purpose it has been used at the College quite extensively in past years. The lambs have always done exceptionally well when pasturing on rape, their health has been good, and their increase in live weight has been rapid.

As a number of other crops have become more or less prominent for pasture purposes in the autumn of the year, experiments have been conducted at the College in which comparative results have been made of a number of crops which resemble each other somewhat closely. These experiments include kale, cow cabbage, sprouting boroccoli, as well as rape, and furnish some good information in the comparative results when grown in Ontario under similar conditions.

In 1913 there were thirteen varieties belonging to the rape class under experiment. The crops were all sown in rows 3 1-3 links (26 2-5 inches) apart. Each plot was exactly 1-100 of an acre in size, consisting of three rows each four rods in length. The seed was sown on June 24th. The land between the rows was cultivated occasionally throughout the growing season. When the crops had reached their best condition for feeding each variety was cut with a scythe and weighed immediately.

The cow cabbage, when grown in England, is usually transplanted and the plants are placed at a sufficient distance apart to enable them to form heads. In our

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experiments at Guelph, however, we have treated the cow cabbage in exactly the same way as we have treated the rape. The heads of the cabbage, therefore, have been quite small, the growth being principally leaf and stem.

The following table gives the results of each of ten varieties of rape, kale, cabbage, etc., grown in 1913, and for the average of six years:—

Varieties.	Height.		Green Fodder per acre.	
	1913.	Average 6 years, 1908–1913.	1913.	Average 6 years, 1908–1913.
	ins.	ins.	tons.	tons.
World Beater Cabbage (Darch & Hunter)..	15	19	16.35	24.82
Simmers' Early German Brunswick Cabbage	12	15	16.45	24.03
Simmers' Matchless Flat Dutch Cabbage ...	14	17	14.60	22.80
Sutton's Earliest Drumhead Cabbage.....	13	18	16.50	22.55
Sutton's Giant Drumhead Cabbage.....	15	19	14.75	22.14
Sutton's Earliest Sheepfold Cabbage.....	13	17	14.25	21.62
Large Seeded Umbrella Rape.....	17	27	11.50	19.61
Thousand Headed Kale (Hunter & Co.)....	20	31	10.55	19.23
Dwarf Essex Rape (Steele-Briggs).....	11	24	7.75	18.13
Sutton's Purple Sprouting Boroccoli.....	15	27	10.00	18.11

The Dwarf Essex Rape, which has been grown so prominently in Ontario, occupies the second lowest place in production of green fodder of all the varieties under experiment for the six year period. The three highest yielding varieties are cabbages, the seed of which is obtainable in Ontario. The yields per acre in 1913 were much lower than usual, none of the varieties reaching seventeen tons of green crop per acre. It will be seen that the yields per acre of all the different varieties of cabbage under experiment for six years have given larger yields than the highest average yield of corn for a period of five years, the results of which are presented in an earlier part of this report. The appearance of the cabbage when growing in the field is very deceiving, as it does not grow nearly as tall as the rape, and always makes a much higher record at the time of harvest than most people would imagine.

Each of five varieties of rape, cabbage and boroccoli have been grown in the experimental grounds for a period of fourteen years. The following table gives the average results of the duplicate plots grown in 1913, and also the average for the fourteen year period:—

Varieties.	1913.	Average, 14 years.
	tons.	tons.
Sutton's Earliest Drumhead Cabbage.....	16.50	23.84
Thousand Headed Kale.....	10.55	21.14
Sutton's Earliest Sheepfold Cabbage.....	14.25	20.71
Dwarf Essex Rape.....	7.75	19.62
Purple Sprouting Boroccoli.....	10.00	19.00

It will here be seen that the Sutton's Earliest Drumhead cabbage has given an average of nearly 24 tons of green crop per acre per annum for the whole period of fourteen years. This is a very high yield. As these cabbages become better known it is quite probable that their cultivation in Ontario will be gradually extended.

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An experiment has been conducted in each of three years in which the Sutton's Earliest Drumhead cabbage has been thinned in the field to one, two, three, eight, sixteen and twenty-four inches apart. This experiment has been conducted in duplicate each year. Six separate tests made in the past three years show that the greatest yield has been obtained from the plants which were left at a distance of three inches apart, the lowest yield from thinning at a distance of twenty-four inches apart, and the second lowest from thinning at a distance of sixteen inches apart.

Miscellaneous Leguminous Crops for Green Fodder.

In 1913, twenty-one leguminous crops were grown in the experimental department for the production of green fodder. These consisted of varieties of Soy beans, cow peas, vetches and grass peas. All were sown in rows excepting the grass peas, the hairy vetches, and the common vetches, which were sown broadcast. The highest yield in tons of green crop per acre produced in 1913 were obtained from the following varieties: Grass Peas, 7.9; Ito San Soja Beans, 7.6; Hairy Vetches, 7.3; and Chernie Soy Beans, 6.9.

Each of twelve varieties of leguminous crops have been under experiment in each of five years, and the accumulated results add to the value of the information. We here present in tabulated form the average returns for the five year period:—

Varieties.	Average results for five years.	
	Height.	Yield per acre.
	inches.	tons.
Habara Soy Beans, No. 20405 (Wash)	26	7.59
Ito San Soja Beans	24	6.80
Chernie Soy Beans, No. 18227 (Wash)	23	6.77
Grass Peas	32	6.46
Hairy Vetches	26	6.33
Early Yellow Soy Beans, No. 81	24	6.15
Early Yellow Soy Beans	23	5.53
Buckshot Soy Beans, No. 17251 (Wash)	23	5.08
Tsurunoko Soy Beans	23	4.93
Akasaya Soy Beans	24	4.72
Brown Soy Beans	22	4.26
Wonderful Cow Peas	13	3.41

The three highest yielding varieties of leguminous crops in the average results for five years' experiments are Soy beans, and these are followed by the Grass peas as fourth, and the Hairy Vetches as fifth in productiveness. The only variety of Cow peas entered in this experiment occupies the lowest place in yield of green fodder per acre, the yield being less than one-half of that of the highest yielding variety of Soy beans.

For thirteen years in succession four varieties of leguminous crops have been under experiment, and the following table gives the average results in height of crop and yield of green crop per acre for the whole period:—

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Varieties.	Average Results for 13 years.	
	Height.	Yield per Acre.
	inches.	tons.
Hairy Vetches	29	6.95
Grass Peas	34	6.94
Early Yellow Soy Beans	25	6.49
Wonderful Cow Peas	15	4.72

In this short table we have four different classes of leguminous crops represented, viz., the vetches, grass peas, soy beans and cow peas. These are four very good representatives of the different classes. The average results for the fourteen year period show that the hairy vetches have given practically seven tons of green crop per acre per annum, or 91 tons of green crop per acre in the thirteen years. The hairy vetches which occupy the highest place in average yield per acre of the thirteen year period are used in Ontario not only as a fodder crop, but also as a cover crop for orchards, and for this purpose they are spoken of very highly by those who have used them more or less extensively.

Pasture Crops.

We are indebted to the Ontario Bureau of Industries for the information that in 1912 there were 3,082,671 acres of pasture on the cleared land in Ontario. This acreage along with that used for the production of hay makes a total of 6,450,040 acres of Ontario land on which grasses and clovers were grown for hay and for pasture in the one year. There has been a gradual decrease in the pasture lands of Ontario since 1906, previous to which time there was a gradual increase in the acreage with a few slight exceptions from 1887 forward. It is to be hoped that the present decrease in the pasture lands of Ontario indicate more intensive cultivation, also that greater attention is being paid to the production of those pastures which are more abundant in growth, and are of better quality than those which have been used in past years. Timothy is not particularly a good pasture grass, and yet it is used more extensively than any other variety. There are too many old timothy sods in Ontario. It is a question if the pasture production in Ontario is not one of the weakest parts of the agriculture of the Province. A large number of varieties of grasses, clovers and grains have been tested at the Ontario Agricultural College both singly and in combination for the production of pasture. The results are presented under three separate headings.

Annual Crop for Pasture. Until recently but little was said or known in regard to annual pasture crops, or, in other words, the sowing of crops in the spring for the production of pasture in the same year. Enquiries were frequently made by farmers as to what could be sown in the spring of the year which would furnish the best results in pasture in the same season. Practically no information could be gleaned from the the results of experiments which had been carried on elsewhere. It was, therefore, the place of this institution to inaugurate a line of experiments to discover which varieties or mixtures of varieties would form the most suitable temporary pastures, and as the result of testing seventeen crops separately, and in six different combinations within the past seventeen years we have gleaned information which we believe to be of some service. If a farmer

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realizes in the autumn or in the early spring that his pasture crop is going to be deficient for his requirements during the coming summer, and writes to us for information as to what he can use to the best advantage we are in a position to give him an intelligent answer. For average conditions in Ontario we have found the following combination to be the most serviceable for sowing in the spring for producing a pasture in the same year, viz.: Oats, 51 lb.; Early Amber Sugar Cane, 30 lbs.; and Common Red Clover Seed, 7 lbs.; making a total of 88 lbs. of seed per acre.

The oats and the sugar cane are mixed together, and are sown from the grain box of the seed drill, and the clover is sown from the grass seed box placed in front of the tubes of the drill. If this mixture is sown during the first week in May, it is usually ready for pasture about the 20th of June. The oats are early and rapid in growth; the sugar cane is later, stools well and thrives in hot weather; and the clover forms the principal pasture in the autumn. All varieties are readily eaten by the animals, especially the oats and the sugar cane. If desirable, the clover may be allowed to remain over winter to furnish one or two cuttings in the following year. The tramping by the cattle has not caused any marked degree of injury, either to the plants or to the soil. During each of the past five years we have had eight or nine acres of this pasture which has carried more than one two-year-old steer per acre. The animals have thrived splendidly, keeping in the best of health, and gaining, on the average, about two pounds per day.

Pasture Crop for Two or More Years. Many farmers seed their grain with timothy and common red clover, and, after taking off one crop of hay, use the land for pasture until it is again plowed. The clover soon disappears, and the timothy forms a comparatively poor pasture, especially in dry seasons. The following mixture in pounds per acre is better for pasture purposes.—Red Clover, 6 lbs.; Alsike Clover, 3 lbs.; Orchard Grass, 3 lbs.; Meadow Fescue, 3 lbs.; Timothy, 3 lbs.; making a total of 18 lbs.

This mixture can be sown in the spring of the year, either with or without a grain crop. It should be sown in front of the tube drill; the clover and the timothy from the grass seed box, and the orchard grass and meadow fescue by hand. It could be used as a hay crop in the following year, and for pasture afterwards. In comparison with timothy, this mixture will start earlier in the spring, produce a greener growth in the hot, dry months of the summer, and furnish a more abundant growth of leaves in the autumn.

Crop for Permanent Pasture. Land which is not required in the regular rotation of the farm can often be seeded with a permanent pasture mixture to excellent advantage. From more than twenty years' work in testing different varieties of grasses and clovers, both singly and in combination, I would suggest the following mixture in pounds per acre for a permanent pasture under average conditions of soil, drainage and climate: Alfalfa or Lucerne, 5 lbs.; Alsike Clover, 2 lbs.; White or Dutch Clover, 2 lbs.; Orchard Grass, 4 lbs.; Meadow Fescue, 4 lbs.; Tall Oat Grass, 3 lbs.; Meadow Foxtail, 2 lbs.; Timothy, 2 lbs.; making a total of 24 lbs.

The seed of this permanent pasture mixture can be sown in the early spring, either with or without a grain crop. It is better to follow some cultivated crop which has been carefully looked after during the previous season. If the seed is sown alone the tops of the plants should be cut occasionally during the summer and allowed to lie on the ground as a mulch. If a nurse crop is used, about one bushel

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of barley or of wheat per acre is recommended. As a rule, oats do not form a good nurse crop for a permanent pasture mixture. The seed for the permanent pasture should be sown in front and not behind the tube drill. Some of the finer seeds can be sown from the grass seed box, and the others by hand.

Such a mixture as this, when once well established on suitable land, should produce a good pasture, appetizing to the animals, excellent in quality, abundant in growth, and permanent in character.

The Production of Alfalfa in Ontario.

The history of alfalfa growing in Ontario is rather an interesting one. Some farmers have grown alfalfa with very marked success, while the experience of others has been entirely opposite. In order to grow alfalfa successfully in this province it is of the utmost importance that the best methods for its cultivation be followed. These include the use of the proper variety of alfalfa, the condition of the soil and the subsoil, the amount of water or moisture in the land, the method of sowing, the time of sowing, the care of the crop, etc.

The following table gives the yields per acre of the different cuttings of green fodder and hay as produced at the College in each of sixteen years:—

Years.	Green Crop.					Hay.				
	First Cutting.	Second Cutting.	Third Cutting.	Fourth Cutting.	Total.	First Cutting.	Second Cutting.	Third Cutting.	Fourth Cutting.	Total.
	tons.	tons.	tons.	tons.	tons.	tons.	tons.	tons.	tons.	tons.
1896..	9.96	6.47	4.06	2.06	22.55	3.08	1.91	1.29	.65	6.93
1897..	12.04	5.61	4.42	.....	22.08	3.59	1.56	1.23	.....	6.38
1898..	9.71	5.85	2.64	.....	18.20	2.30	1.75	.63	.....	4.68
1900..	11.93	6.00	1.60	.....	19.53	2.33	1.47	.80	.....	4.60
1901..	9.70	2.20	7.49	.....	19.39	2.03	1.00	1.50	.....	4.53
1902..	13.35	8.69	2.96	.....	25.00	2.50	2.02	.54	.....	5.06
1903..	13.10	8.53	2.75	.....	24.38	2.50	2.09	.67	.....	5.25
1904..	12.45	9.35	4.00	.....	25.80	3.40	2.50	1.08	.....	6.98
1906..	9.78	6.60	4.85	.....	21.23	2.55	1.13	.58	.....	4.26
1907..	14.55	3.95	.....	.....	18.50	2.95	1.05	.....	.....	4.00
1908..	9 70	6.75	3.73	.....	20.18	2.50	1.15	.75	.....	4.40
1909..	8.68	4.56	.84	.....	14.08	2.52	1.40	.14	.....	4.06
1910..	15.08	3.88	4.76	.....	23.72	2.94	.80	1.32	.....	5.06
1611..	8.00	1.80	1.36	.....	11.16	1.76	.34	.30	.....	2.40
1912..	9.48	4.68	4.72	.....	18.88	2.08	.99	.56	.....	3.63
1913..	9.51	2.96	1.90	.....	14.37	2.55	.91	.62	.....	4.08
Aver. 16 yrs.	11.06	5.49	3.26	.13	19.94	2.60	1.38	.75	.04	4.77

These results have been obtained from experiments conducted in different parts of the experimental grounds. The seed was usually sown at the rate of 18 or 20 pounds per acre, and in connection with a grain crop, such as barley, at the rate of one bushel per acre. The results are mostly those obtained from crops which have been seeded from three to six years. In each of fourteen years the alfalfa gave three cuttings, but in 1907 it produced only two, while in 1896 it gave four cuttings in one season. The spring of 1896 opened up very early, and that of 1907 very late. It will be seen that the yields of the past three years have been less than those of any other three years in succession. This is undoubtedly due to the unfavorable weather conditions for alfalfa production the

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last few years. It will be seen that the first cutting in the season is about double the second, and that the second cutting is about double the third. The average yield of green crop per acre per annum has been practically twenty tons, and the average yield of hay per acre per annum has been nearly five tons.

For successful alfalfa growing in Ontario it is necessary to select land having a clean, mellow, fertile surface soil overlying a deeply drained, sweet subsoil. Use large, plump seed of a hardy variety, such as the Ontario Variegated and the Grimm, and which is free from impurities and is strong in germinating power. Inoculate the seed with the proper kind of bacteria, providing alfalfa has not been grown successfully on the land in recent years. Sow the alfalfa seed at the rate of about twenty pounds per acre. The seeding may take place according to any one of the following methods:

1. Alfalfa seed may be sown on winter wheat in the early spring either on the old snow or on a fresh snow of one or two inches and no harrowing or cultivation is necessary.

2. On a suitable seed bed and as soon as the land is sufficiently dry in the spring, alfalfa seed may be sown from the grass seed box placed in front of the tube drill. About one bushel of barley, wheat or rye per acre sown from the tubes of the drill makes a very good nurse crop. After the seed is sown the land should be harrowed lightly.

3. Alfalfa may be sown alone in the month of July on a summer fallow, providing there is sufficient moisture for good germination.

Alfalfa should never be pastured during the first year and seldom, if ever, afterwards, as pasturing very frequently destroys the plants. The crop should be cut for hay or for green fodder in the following year after the seeding takes place as soon as it starts to bloom. Care should be taken to retain as many of the leaves on the stems as possible and to protect the crop from rain. In many places in Ontario the alfalfa will produce three crops of hay per acre per annum. The third cutting, however, may be used to advantage for mixing with corn when filling the silo, as this forms an easy method of handling the green alfalfa in the autumn, and also of improving the quality of the corn silage.

If the directions here given are carefully followed the alfalfa may be expected to produce large and valuable crops for a number of years without re-seeding.

For a fuller report of the results of experiments in growing alfalfa the reader is referred to a bulletin on the subject which will be printed in the near future by the Ontario Department of Agriculture, Toronto.

The writer of this report has the earnest hope that the results here submitted may prove of real value in the advancement of crop production in Ontario, and that the information imparted may assist the farmers who are already doing much on behalf of the progress and the betterment of this province.

Respectfully submitted,

C. A. ZAVITZ.

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PART XIV.

THE PROFESSOR OF VETERINARY SCIENCE.

To the President of the Ontario Agricultural College:

SIR,—I have the honor to submit my report for 1912-13.

CLASS ROOM.

The course of instruction was according to the College Calendar and similar to that of previous years, hence it would not be advisable to take up space with details. To the first year I delivered a course of lectures and demonstrations on Veterinary Anatomy, Veterinary Materia Medica, the Erection of Horse Stables, Care of Horses, and Judging Horses. To the second year, I lectured and demonstrated on Veterinary Medicine and Surgery, Veterinary Obstetrics, Education and Handling of the Horse, and Horse Judging. To the fourth year, I gave instructions in Judging Horses.

SHORT COURSE IN STOCK JUDGING.

For this class I supplied fair representatives of the different classes of horses for scoring and judging purposes. For all classes except those of the Clydesdale type we were dependent upon the kindness of local breeders and dealers. As no fund is provided for the purpose of paying for the use of the horses we find it hard to procure satisfactory specimens. The same remarks apply to general class-room work of this nature.

To the short course students in Dairying, I delivered a few lectures on the ordinary diseases of dairy cattle.

INJURIES AND DISEASES OF THE STOCK.—In the different classes of stock we had cases of ordinary diseases, but they all yielded to treatment and we had no fatalities except in newly-born animals.

I have, Sir, the honor to be your obedient servant,

J. H. REED.

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PART XV.

THE LECTURER IN ECONOMICS.

To the President of the Ontario Agricultural College:

SIR,—There is little change in the character of this work from year to year, except that the classes are getting larger.

ECONOMICS.

During the winter and fall terms of 1913, the regular courses of lectures for Second, Third, and Fourth Years, as outlined in the College calendar, have been given, and it is my pleasure to report the keenest interest on the part of the students taking this work.

PUBLIC SPEAKING.

My work in this connection was carried on as usual with the Second Year, during the winter term. The progress made by the class as a whole is most remarkable. Many of the students, who, at their first attempt could scarcely do anything, had so far mastered the art at the end of the term as to be able to deliver a very good address without notes or prompting of any kind. It is not the least important feature of the work that the student meets, in his own classmates, perhaps as difficult and unsympathetic an audience as he is likely to meet anywhere in after life. Everything is done, of course, to make it as easy for the beginner as possible, but the fact remains that he must stand alone on the platform and speak. My aim in this office has been to offer helpful criticism and suggestion to the pupil upon all the common devices for entertaining the hearer, while at the same time instructing him.

ENGLISH COMPOSITION.

During the term just ending I have been able to read and criticize four essays for each student, in a class of over one hundred. This is, by far, the most exacting work of all the courses taken by me. The redeeming feature of this branch of my work is that the progress made is more marked than in any other; indeed, it has been my pleasure on several occasions to be able conscientiously to place a student in first-class honors at the end of the term, who could scarcely qualify for a pass at the time of his first attempt.

Respectfully submitted,

H. H. LEDREW.

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PART XVI.

REPORT OF THE DIRECTOR OF HOME ECONOMICS.

To the President of the Ontario Agricultural College:

SIR,—I have the honor to submit herewith the tenth annual report of the work of the Home Economics Department for the year 1913.

THE WORK IN GENERAL.

The courses of instruction as indicated in the College calendar have been carried out. There are no changes of method to record, and the work is running smoothly. Following are detailed statistics of the different classes of work.

THE TWO-YEAR NORMAL COURSE IN DOMESTIC SCIENCE.

Fourteen entered this course in 1911; twelve passed on to the senior class in 1912; eleven passed the final examinations last June, and have received the Macdonald Institute Teacher's Certificate in Domestic Science. Fourteen were admitted to the junior class in September, 1912; twelve passed on to the senior class last September, and are now in attendance. Thirteen were admitted to the junior class last September and are now in attendance.

THE ONE-YEAR NORMAL COURSE IN HOUSEHOLD SCIENCE.

Ten were admitted to this class in September, 1912; nine passed the final examinations last June, and have received the Macdonald Institute Teacher's Certificate in Household Science. This year's class was chosen from over fifty applicants, and was limited to ten, who are now in attendance.

THE ASSOCIATE COURSE.

The first class of nine entered this course in 1912; eight passed on to the senior class this year and are now in attendance. Twelve were admitted to the junior class last September.

THE HOUSEKEEPER COURSE.

Thirteen entered the course in September, 1911; twelve passed on to the senior class September, 1912, passed the final examinations last June, and have received the Macdonald Institute Housekeeper Certificate. Six entered the junior class September, 1912; four passed on to the senior class last September and are now in attendance. Nine entered the junior class last September.

THE HOMEMAKER COURSE.

Twenty-six entered the course opening September, 1912; twenty passed the final examinations last June and have received the Macdonald Institute Homemaker Diploma. Thirteen entered the course last January, of whom five passed the final examinations of December, 1913, and have also received the Homemaker Diploma. Twenty-six entered the course last September, and are now in attendance.

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The Short Courses in Domestic Science.

These had in attendance in the

Winter term, from January to March	26
Spring term, from April to June	22
Autumn term, from September to December	24

Other Students.

Fifteen optional students joined various sewing and lecture courses through the year.

Five student-workers have taken the opportunity to pay for courses by service in Macdonald Hall.

Women's Institute Work.

The work of helping Women's Institute members to prepare papers or speeches for their meetings by lending them material from our library and clipping collection, continues to grow. We had requests for information on:

Home Interests	101
House and Housekeeping	105
Food and Cookery	156
Dietetics	14
Health	48
Household Finance	31
Home Economics Education	33
Clubs, Social Service, etc.	193
Gardening and Agriculture	26
Miscellaneous	37
Total	744

and these requests were answered with

2,438 folders, with pamphlets, articles or clippings.
103 books.
24 special letters.
82 letters regretting that material wanted was already out on loan.
44 letters referred to other departments, or to Mr. Putnam.

Needs of the Home Economics Department.

We reported last year that the work of this Department has been hampered for several years. Nothing has been done during the last year to improve matters and permit expansion, and the pressure is becoming greater. We now accept about half the applications received.

Miss Walsh was obliged to resign on account of ill health, and Miss Netta Nixon was engaged in her place.

I beg to acknowledge the good work of the other members of the staff, and the assistance given by other Departments of the College.

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Appointments of Macdonald Institute Graduates in 1913:—

Teacher's name.	Class of	Appointed to
Miss N. Burke	1911	Evangelia Settlement, Toronto, Ont.
" H. Campbell	1913	Public Schools, Hamilton, Ont.
" A. Davis	1912	Public Schools, Edmonton, Alta.
" F. Day	1913	Public Schools, Regina, Sask.
" A. DeLury	1906	University of Saskatchewan, Saskatoon, Sask.
" E. Ferguson	1905	Normal School, Peterborough, Ont.
" V. Gardner	1906	High School, Stamford, Ont.
" N. Goldie	1913	Hoebridge Overseas Training School, Woking, Eng.
" R. Goldie	1913	St. Christopher's Settlement, Toronto, Ont.
" C. Green	1910	Normal School, North Bay, Ont.
" L. Griffin	1913	Technical School, Winnipeg, Man.
" E. Gromitt	1909	Havergal College, Toronto, Ont.
" A. K. Hull	1912	Technical School, Calgary, Alta.
" M. Johnson	1913	Public Schools, Ottawa, Ont.
" M. C. Kay	1913	Consolidated School, Guelph, Ont.
" C. McCaig	1907	Normal School, Calgary, Alta.
" E. McGregor	1913	Public Schools, Collingwood, Ont.
" C. MacLaurin	1913	Public Schools, Saskatoon, Sask.
" E. Maddox	1912	St. Johns, Newfoundland.
" N. Nixon	1909	Macdonald Institute, O. A. C., Guelph, Ont.
Mrs. M. Oliver	1910	Paris, Ont.
Miss L. Peers	1910	Mountain View, California, U.S.A.
" H. Plews	1912	Public Schools, Ottawa, Ont.
" F. Pringle	1910	Public Schools, Smith's Falls, Ont.
" J. D. Ross	1907	Public and High Schools, Port Arthur, Ont.
" I. Shaw	1912	Public Schools, Moose Jaw, Sask.
" A. Shorey	1913	Public Schools, Ottawa, Ont.
" R. Templeton	1913	Public Schools, Belleville, Ont.
Housekeepers.		
Miss J. Currie	1911	Y. W. C. A., Moose Jaw, Sask.
" J. Elliott	1911	Annesley Hall, Toronto, Ont.
" H. Johnson	1913	General Hospital, Brandon, Man.
Mrs. M. McPhadyen	1913	Ontario Ladies' College, Whitby, Ont.
Miss R. Nesbitt	1913	General Hospital, Brantford, Ont.
" M. O'Droskie	1913	Miss Edgar's School, Montreal, Que.
" M. K. Rutherford	1909	Manitoba Agricultural College, Winnipeg, Man.
" E. Schwalm	1913	University Hospital, Ann Arbor, Mich, U.S.A.
" M. Turpin	1913	Manitoba Agricultural College, Winnipeg, Man.
" L. Wright	1912	General Hospital, Owen Sound, Ont.
Dietitians.		
Miss L. A. Beattie	1913	Victoria Hospital, London, Ont.
" E. Robertson	1908	General Hospital, Toronto, Ont.
Women's Institute Work.		
Miss K. James	1909	Department of Agriculture, P. E. I.
Miss M. Goldie	1910	Department of Agriculture, Alberta.
" E. Chapman	1912	Department of Agriculture, Ontario.

Respectfully submitted,

MARY URIE WATSON.

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PART XVII.

THE PROFESSOR OF MANUAL TRAINING.

To the President of the Ontario Agricultural College:

SIR,—I have the honor to submit herewith the tenth annual report of the Department of Manual Training and Farm Mechanics.

The course of instruction outlined in the College Calendar for the First Year students has been carried out in its entirety, but the course set down for the second year in Farm Mechanics had to be considerably modified and curtailed, as no competent help was available to give instructions in the various implements. At present, the writer has to take charge of two groups of students working in

Macdonald Students. Short Course—Colour and Design, 1912.

two different rooms. This arrangement is not conducive to efficiency. The course aims to furnish the student an opportunity to become acquainted with the working of machinery of the utmost importance in cultivation and other farming operations: an opportunity to get an understanding of the principles involved in the various machines, and of gaining a practical knowledge of how to overcome the difficulties encountered in operating modern farm machinery. To acquire this special knowledge of the special matters which will constitute the life work of the student is even more necessary to insure success, than is the obtaining of a broad general knowledge of general affairs, as it is adapted to equip the individual for the battle of life in the best possible manner, and with the least expenditure of energy.

Early in the year we were notified by the Department of Education that the Spring and Summer courses hitherto held here in Manual Training and Art would be discontinued, and that in future the work will form part of the Academic Summer Courses established in Toronto.

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Instruction in Woodworking, Drawing, Forging, Machine Shop work, and Farm Mechanics was given to the regular course students of the College, and in Plain Woodworking and in Colour and Design to students of the Macdonald Institute. To Short Course students in Gasoline Engine; and in the various subjects embraced by the term Manual Training, to the full course students.

Six students entered for the Normal Course in Manual Training in the fall of 1912. Of these, one, Mr. W. G. Myrick, left in March last, to fill a temporary position in Ottawa. Four completed the course in June, and wrote off their final examinations. The remaining student, Mr. D. W. Gillies, is continuing his course. I am pleased to report that the work of those students who completed the course was in every respect very creditable. Their names have been forwarded to the Department of Education as having successfully completed the prescribed work for the certificate in Manual Training. They are also entitled to the certificate issued by the College, and I recommend that it may be granted to each of them.

Mr. J. S. Clubine, Ringwood, Ont.
Mr. F. J. Tench, Midland, Ont.
Mr. C. M. DeGroat, Ingersoll, Ont.
Mr. J. W. Milne, Toronto, Ont.
Mr. J. R. Sayer, Guelph, Ont.

Of these gentlemen four have been appointed to positions at:—

Windsor—J. S. Clubine.
Stratford—F. J. Tench.
St. Thomas—C. M. DeGroat.
Macdonald College—J. W. Milne.

Mr. J. R. Sayer is qualifying for a Specialist's standing by putting in a year's employment as a mechanic in a shop, as required by the Regulations of the Department of Education.

Donations of farm implements and machinery for Machinery Hall were received from the International Harvester Company, Hamilton:

1 6 ft. New Ideal Binder, with B tongue truck, one trans. and one carrier.
1 6 ft. Giant Mower.
1 12-16 M. T. Disc, with 3 horse eveners and one fore carriage, complete.
1 7 ft. L. H. Binder, with B tongue truck, one trans. and one carrier.
1 5 ft. V. L. Mower.
1 No. 3 Corn King Spreader, D. P., worm feed, sta. rake.
1 Steel Windrow Loader.
1 Fore Carriage.
1 Gearless Rake Loader.
1 2½ h.p. Famous Gasoline Engine, with 5 in. ring pulley and magneto.

In conclusion, I desire to thank the International Harvester Company for their valuable contribution of machinery, and to express my appreciation of the earnest co-operation of my assistant, Mr. Kendall, in the work of this department.

I have the honour to be, Sir,

Your obedient servant,

JNO. EVANS.

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PART XVIII

THE LECTURER IN APICULTURE.

To the President of the Ontario Agricultural College:

SIR,—I have the honor to submit the Annual Report of the Apiculture Department for 1913.

There has been no change in the curriculum. The class work has been the same except that the over-crowded condition of the class has made demonstrations difficult and practical work impossible. The January Short Course was more largely attended than ever before. A three weeks' course of instructions was given in May to Apiary Inspectors. The correspondence with bee-keepers in reply to questions pertaining to practical management continues to grow. The Bulletin on "Diseases of Bees" was revised and published as Bulletin 213. A booklet on

Practical Work in College Apiary.

"Spring Management of Bees" was prepared for use by members of the Apiculture Division of the Experimental Union. Occasional contributions to the Agricultural Press, press bulletins sent to the Ontario newspapers on subjects of timely interest to bee-keepers, and lectures at conventions and demonstrations, filled out the time spent on my work as an instructor. The balance of my time has been amply filled with experimental work in the apiaries at the College, Vineland Station and Monteith; also with the administration of the Foul Brood Act and executive work as Secretary of the Ontario Bee-keepers' Association.

THE CLASS WORK.

The class work is still confined to twenty-five lectures given to the first year students. As stated above the crowded condition of the class has made it impossible to give any practical work or to take them to the apiary for demonstrations. I have used the stereopticon to overcome this lack as far as possible.

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In the study of apiculture one must first investigate the behaviour and from that the psychology of the bee. On this depends all our methods of management of bees more than of other live stock, because they do not submit or adapt themselves to unfavorable conditions. A horse, for example, may be compelled to live and serve his master in a stable with wide variations of temperature, light, moisture or other factors. A colony of bees under similar treatment would either perish or fly away. The student of apiculture then must first learn the elements of the life history, behaviour and psychology of the bee. From this he can be led on to the problems and principles of management. This fact might be illustrated by our treatment of the swarming problem. The student learns that swarming is a natural phenomenon which takes place not at a certain season but under a certain psychological condition of the colony. This condition, called "the swarming impulse," the successful apiarist seeks to control. In order to control it the student must learn its causes, so he may take steps to cause the colony to "change its mind" before swarming actually takes place.

The same plan of giving the inexperienced student principles rather than particular methods of management is adopted throughout the whole course, and where he has followed the work carefully he is in a position to go into the apiary of any successful bee-keeper and learn methods of management very readily and with intelligence.

This first year work could and should be followed up by more advanced work along both scientific and practical lines in the senior years, supplemented by apiary work under this Department or with some good bee-keeper during the summer vacations. It is a notable fact that most of our best students, who wish to specialize in apiculture, drop out at the end of the first or second year, because the College curriculum has nothing more to offer them. This seems to be a weakness of our course at present, and a serious handicap to the work of this Department. The only apiculture student who has gone up for graduation, Mr. F. E. Millen, of the class of 1913, went immediately after graduation to a good salaried position as State Apiary Inspector and Lecturer in Apiculture at the Michigan Agricultural College. Mr. Kingsmill, the only apiculture student in the class of 1914, already has a good Canadian position offered him when he graduates. With this work opening up in practically all of the Provinces and many of the States of the Union, it seems a pity that a student should be compelled after the first year to secure his training for apiculture work entirely outside his regular college course.

The Short Course.

The interest in the two weeks' Short Course in Bee-keeping held during January, 1913, was even greater than it was in 1912. The registered attendance of fifty-nine was increased during the second week by a number of prominent bee-keepers from different parts of Ontario who dropped in for a few days and neglected to leave their names. The general outline of the programme was much the same as in 1912. Mr. P. G. Clark very kindly came over from Marietta, New York, to repeat his series of instructive demonstrations on queen breeding. One of the most interesting speakers was Dr. Burton N. Gates, Ph.D., Assistant Professor for Apiculture, of Massachusetts Agricultural College, Amherst, Mass. Dr. Gates addressed the class on the life history of the bee, on the home of the bee and its food, also on some experiences of New England fruit growers with bees as pollenizers. While here Dr. Gates gave the Apiculture Club an address on experiments conducted by himself along the lines of bee psychology.

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In addition to subjects handled by myself and by other members of the College staff, who very kindly gave lectures on subjects allied to bee-keeping, the various problems of management were very ably handled by the following Ontario bee-keepers: Mr. R. E. L. Harkness, Irena; Mr. H. G. Sibbald, Toronto; Mr. J. F. Dunn, Ridgeway; Mr. Denis Nolan, Newton Robinson; Mr. E. T. Bainard, Lambeth, and Mr. J. L. Byer, Markham. Mr. P. W. Hodgetts, Director of the Fruit Branch of the Ontario Department of Agriculture, very kindly contributed a paper on "What Organization has to Offer the Bee-keeper." The Course concluded with a conference of apiary inspectors on the foul brood situation in Ontario.

Course for Apiary Instructors.

Beginning the 28th April, the men who were to act as apiary instructors, were given a three weeks' course of training in apiary management and demonstration work. This course consisted of one or two classes each day, when practical subjects previously assigned in the text-book were taken up and thoroughly discussed. The men were then taken to the apiary and given a thorough drill in handling bees and in all kinds of practical manipulations of the hives and combs. Particular attention was given to the study of the brood so as to train them to quickly detect both healthy and unhealthy conditions.

An equally important part of the programme was practice in conducting apiary demonstrations. For this purpose the members of the class were arranged in pairs who were required in turn to conduct demonstrations before the remainder of the class in exactly the same manner as they would before a gathering of bee-keepers.

Apiary Demonstrations.

Just as soon as the weather would permit, the actual demonstration and inspection work was started throughout the Province and continued to the end of the season. About one thousand visits were made to apiaries for purposes of inspection, and fifty-nine demonstration meetings were conducted with an average attendance of thirty-two. This is an increase over last year's attendance, showing the increasing popularity amongst bee-keepers of meetings of this kind. During September and October these same men conducted Information Bureaus on bee-keeping at about thirty fall fairs. This work, also my work as Secretary of the Ontario Bee-keepers' Association, will be fully reported in the annual report of the latter organization.

Experimental Union.

The report of the Apiculture Division of the Experimental Union will be given fully in the Annual Report of the latter organization, but it will be of interest to give summarized results in this place. Five different experiments were sent out during 1913; three on the management of the swarming problem, one on the spring management of bees and one on races of bees. Three hundred and forty-eight applications were received from bee-keepers in all parts of Ontario for these different experiments. One hundred and twenty applications were made for the experiment on races of bees. The material for this consisted of a queen bee of selected stock, which the experimenter was asked to introduce to one of his colonies and compare during the present and following seasons with some of his own stock. Results here have shown quite uniformly that bees of the Italian race give better results both as producers of honey and as resisters of disease.

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From the two hundred and twenty-eight bee-keepers who were conducting the other four experiments, sixty-two reports were received. The apiaries of these men aggregated 2,187 colonies in the spring of 1913 and their honey crop was 232,250 pounds, being an average of one hundred and six pounds per colony. Comparing the results obtained by our experimenters with the average crop reported for the Province, which was less than seventy pounds per colony, we see that persons taking part in co-operative experiments in apiculture had an advantage of at least thirty-five pounds per colony over the average of those who did not co-operate.

Circular Letters.

There are certain times when a word of advice or warning will be of financial value to every bee-keeper in the Province. The best way to get this message to him without sending a personal messenger is to send him a letter to his post office address, through his newspaper, or through his bee journal. All of these methods have been adopted by the Apiculture Department during the past year. Even the

Apiary Demonstration, explaining Foul Brood treatment.

messenger has gone in the person of the apiary inspector and demonstrator. Circular letters from time to time have been sent to the complete list of bee-keepers consisting of over six thousand names or to the list of members of the Ontario Bee-keepers' Association, now fourteen hundred and fifty. The members of the Association can be reached through their official organ *The Canadian Horticulturist and Bee-keeper,* and advantage has been taken of that medium every month. Press bulletins have gone from time to time to the list of about four hundred and forty newspapers and agricultural journals published in the Province. These have been in the nature of advice and warnings. For instance, the peculiar nature of the fall season of 1912 made it advisable to warn bee-keepers against the danger of their bees starving during the winter, owing to lack of stores. The danger of diseases of bees being spread by robbing during the first warm days of spring makes it helpful to send in plenty of time a letter of warning to bee-

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keepers in districts where disease is known to be prevalent. I wish here to thank the editors of local papers throughout the Province for their hearty co-operation in publishing bulletins of this nature.

Conventions.

It is a part of my duty to assist bee-keepers to organize local branches of the Ontario Bee-keepers' Association, and during the year the following County Bee-keepers' Associations were organized: Elgin, Frontenac, Grey, Kent, Lambton, Lennox and Addington, Prince Edward and Stormont. In June I went on the invitation of the Secretary of the Massachusetts Bee-keepers' Association to assist at their Annual State Convention at Amherst. In September the New Brunswick Department of Agriculture invited me to assist in bee demonstrations at the Fredericton Exhibition and to help the bee-keepers of the Province to organize a Provincial Association. These trips outside of Ontario were very much appreciated as affording an opportunity to study conditions other than our own and to acquire a broader outlook on agricultural education.

The Apiaries.

In my first Annual Report several lines of experimentation were outlined, but owing to pressure of organization and executive work these have been compelled to wait. Now that the Department is getting organized more attention can be given to the apiaries. We have three of these; one of forty colonies at the College, one of sixty-five colonies at the Horticultural Experiment Station in the Niagara district and one of two colonies at the Demonstration Farm, Monteith, in New Ontario. It is my intention to increase all of these apiaries as rapidly as the other work of the Department will allow, placing out-apiaries in the neighborhood of each of the three centres. We hope by having so much variation in locality to obtain results that will be of greater value than would be obtained from one apiary at the College. Experiments are now under way along the lines previously indicated.

We have also been able to test some of the latest improvements in machinery used by the more extensive bee-keepers. For instance, the gasoline engine for running the honey extractor has gone through the experimental stage in our apiaries, and is being very generally adopted by bee-keepers throughout the country. The next most important improvements are the steam uncapping knife and the honey pump. The former consists of an ordinary uncapping knife with copper jacket placed over the flat surface so as to form a small steam chest. A copper boiler holding about four quarts of water placed on a coal-oil stove supplies the steam, which passes through a piece of one-quarter inch rubber hose about three feet long into the copper jacket, heating the knife and on out through a small hole at the point of the knife. By means of this knife, which is kept heated continuously during the operation of uncapping, combs can be uncapped for the extractor much more rapidly than they could with an ordinary cold knife. Careful tests have shown that twenty-five to fifty per cent. of the time spent in uncapping can be saved by means of this device. The honey pump is a small rotary pump connected by means of a belt with the cross shaft of the extractor, a pulley wheel being placed on the outer end of the cross shaft. When operating the pump removes the honey from the extractor, lifting it to a height of from eight to ten feet through a one inch pipe connection to the storage tank; thus saving the labor

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and waste attendant on the old method of transferring the honey by means of a pail from the extractor to the tank.

During the year experiments were conducted in transporting bees long distances in combless packages. The advantage of a package of this kind for shipping bees is the fact that it practically eliminates the danger of transporting disease with the shipment. Several shipments were made in all kinds of weather and the

Corner of large extracted honey producing apiary in Victoria County.

results, while not sufficiently complete to give a definite report, were very satisfactory. One of the best commercial fields opening up to our work is the great increase in the demand for Italian bees throughout the Province. A number of colonies were sold from the College apiary during May and early June. Several orders had to be turned away for lack of bees to supply them.

Respectfully submitted,

MORLEY PETTIT.

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PART XIX.

THE PROFESSOR OF NATURE STUDY.

To the President of the Ontario Agricultural College:

SIR,—I have the honor to present a brief report of the Nature Study Department for the year 1913, being the tenth Annual Report of the Department, and the ninth which I have made.

As the work carried on by me as Director of Elementary Agricultural Education for the Department of Education has been fully set forth in circulars and bulletins published by the Department of Education throughout the year, it is not necessary for me to report at length here. These publications have been distributed widely amongst the schools and educational workers of the province. They are concerned entirely with the question of the teaching of agriculture in the schools, the problem with which the Nature Study Department is concerned.

As head of the department my aim is to bring the work and teachings of the College into touch with the schools of the province at large. This is slowly leading to readjustments in the studies carried on in rural schools, which means not only better education but better agriculture.

The work of the year has comprised amongst other things:

(1) The holding of the fifth Normal Teachers' Class in Elementary Agriculture between April 21st and June 27th. Seventeen teachers attended.

(2) The tenth Summer School for Public School Teachers between July 3rd and August 8th, with an attendance of seventy-eight in the first year's class and forty-one in the second year's class.

(3) The first Summer School for High School Science Teachers, July 3rd to August 8th. Twenty-one High School Teachers attended this class besides five Normal School science teachers.

(4) The first School Inspectors' Short Course from August 4th-8th. Eighty inspectors were in attendance.

(5) The revision of the regulations governing the work of teaching agriculture in the public schools. This is printed as Circular 13.

(6) The preparation of courses of study, regulations and plans for introducing agriculture into the High Schools.

(7) The preparation of nine Agricultural Education Bulletins dealing with the teaching of agriculture.

(8) The organization and supervision of a field force of Field Agents. For this six college students who were experienced in public school work were chosen. The province was divided into six districts and the schools teaching agriculture were visited, helped and reported on.

(9) The giving of instruction in agriculture in the Model Schools. This work was done by our Field Agents. Sixteen schools were visited.

(10) The continuance of the work of the Schools' Division of the Experimental Union. About 400 schools were supplied with seed and instruction sheets. Through this quite a number of schools have organized School Progress Clubs.

(11) The holding of an exhibit at some of the leading fall fairs. Special exhibits were made at the Toronto, Ottawa, Chatham and London Exhibitions, and the Provincial Winter Fair at Guelph.

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(12) Attending Teachers' and Trustees' Conventions, as well as special meetings at schools. In all about thirty visits were paid. In this I had the help of my assistants, Mrs. H. B. Miller, and some of my Field Agents.

As the officer responsible for the work outlined in the summary just given, I again beg leave to thank all the members of the College staff for the generous help received from them in this task of promoting the teaching of agriculture in the common schools.

Respectfully submitted,

S. B. McCREADY.

PART XX.

THE RESIDENT MASTER.

To the President of the Ontario Agricultural College:

SIR,—I have the honor to submit my first annual report as Resident Master and Lecturer in English, for the year 1913.

The Boys' Residence accommodates two hundred and thirteen students, which, at present, is its full capacity. When the new dining-hall is completed, the number will be increased considerably after alterations have been made in the present residence.

The health of the students has been good on the whole, no diseases of a dangerous nature having occurred during this fall term.

The management of the Fire Brigade is still in my hands, but it would be advisable to give this over to the Engineering Department; this being recommended by Mr. Crawford, Inspector of Fire Equipment.

In the work in English with the First Year class, I take up the principles of Rhetoric, and I also take up Washington Irving's "Sketch Book" as a text-book. I also assign subjects for Composition, which are corrected and returned.

I am, Sir,

Yours respectfully,

N. CURTIS.

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PART XXI.

THE LIBRARIAN.

To the President of the Ontario Agricultural College:

SIR,—I have the honor to submit herewith the report of the Library for the year 1913.

During the year 1,002 books have been added to the Library, making a total of 23,550 volumes on the shelves. Those added during the year are classified as follows:—

Agricultural Reports	90	Fine Arts	14
Agriculture	103	Forestry	11
Bacteriology	48	Geology	14
Bees	8	History	10
Biography	10	Horticultural Reports	16
Botany	48	Horticulture	35
Chemistry	40	Hygiene and Medicine	23
Dairy	25	Literature	36
Description and Travel	26	Manual Training	9
Domestic Animals	43	Meteorology	9
Domestic Science	30	Ornithology	5
Drawing and Decoration	1	Physics	10
Economics	36	Poultry	5
Education	10	Reference and General Periodicals	120
Engineering	46	Science	36
Entomology	20	Science Reports	2
Ethics and Religion	5	Zoology	25
Fiction	33		

The following books among others have been added to the Reference shelves:—

Who's Who, 1913.
Scientific American Cyclopedia of Formulas.
Nelson's Loose-leaf Encyclopedia. 12 vols.
Webster's New International Dictionary.
Dictionary of Applied Chemistry. 4 vols.
Canadian Annual Review for 1912.
Reader's Guide to Periodical Literature, 1912-13.
Cambridge History of English Literature. Vol. 10.
Encyclopedia of Applied Electricity. 7 vols.
Dictionary of National Biography Supplement, vol. 2-3.
Dicken s Dictionary.
Lippincott's Gazetteer of the World, 1913.
World's Masterpieces of Modern Painting.

Through the kindness of Dr. Raymond Pearl, we have been able to secure all the papers of the Biological Laboratory at Orono, Maine. A portrait of Mr. M. F. Rittenhouse, of Chicago, formerly of Jordan Harbor, was presented to the Library by the Ontario Department of Agriculture.

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There were 6,283 books given out to students during the year. These were classified as follows:—

General Periodicals	473	Agriculture	1,337
Philosophy	61	Fine Arts	80
Religion	63	Literature	936
Sociology	798	Fiction	867
Science	1,021	History	159
Useful Arts	373	Biography	115

The foregoing figures represent only the books that were taken from the building. No account can be kept of the books, bulletins, magazines, etc., which are used in the reading room, and this forms a very large part of the Library work.

The monthly index to the magazines is found very useful to those who desire the latest information on all current topics. It is used extensively by students preparing debates, essays and speeches.

When magazines, such as Farmer's, Round Table, University Monthly, and others are not indexed in the Readers' Guide, and contain valuable information on subjects called for by the various classes and debating societies, note is made of the contents on catalogue cards. These are filed in a separate "Where to look" cabinet, and are available when asked for.

In the work of recataloguing, we have been able to finish the botany section, which was begun the previous year. There are now 400 volumes in this class.

We wish to take this opportunity of expressing our appreciation of our exchanges, especially those of the U.S. Department of Agriculture and the Experiment Stations of America, Australia, Cape Colony, England, Europe, India, Japan and South America.

Respectfully submitted,

JACQUETTA GARDINER.

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PART XXII.

THE PHYSICIAN.

To the President of the Ontario Agricultural College:

SIR,—Herein I have the honor of complying with your request for my annual report.

During the winter months, though we had the usual prevalence of influenzal conditions among the students of the College and Hall, in only two instances conditions of gravity developed. These were cases of pneumonia in two young gentlemen of the First Year. They were removed to one of the city hospitals, where, after several weeks, both made good recoveries. The condition of one of these patients for some time, you will recollect, caused much anxiety.

The autumn term opened with a full residence at Macdonald Hall and with the largest attendance of young men, especially in the First Year, in the history of the College. I regret to report that a considerable number failed to observe your requirements regarding vaccination before admission.

It is a pleasure to report that only one accident of gravity and only one case of contagious disease occurred during the year—a young lady of the Hall who contracted scarlet fever. She was removed to the Isolation Hospital in the city, made a good recovery there and the disease spread no further.

Respectfully submitted,

W. O. STEWART.

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REPORT

OF THE

Ontario Veterinary College

1913

(PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE, TORONTO.)

PRINTED BY ORDER OF
THE LEGISLATIVE ASSEMBLY OF ONTARIO

TORONTO:
Printed by L. K. CAMERON, Printer to the King's Most Excellent Majesty
1914

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Printed by
WILLIAM BRIGGS
29-37 Richmond Street West
TORONTO

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To His Honour COL. SIR JOHN MORISON GIBSON, Knight Commander of the Most Distinguished Order of St. Michael and St. George, a Colonel in the Militia of Canada, etc., etc., etc.,

Lieutenant-Governor of the Province of Ontario.

MAY IT PLEASE YOUR HONOUR:

I have the pleasure to present herewith for the consideration of Your Honour the Report of the Ontario Veterinary College, for the year 1913.

Respectfully submitted,

JAMES S. DUFF,

Minister of Agriculture.

TORONTO, 1914.

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ONTARIO VETERINARY COLLEGE

COLLEGE STAFF

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J. E. ANDERSON, 37 Salisbury Ave.
Executive Clerk.

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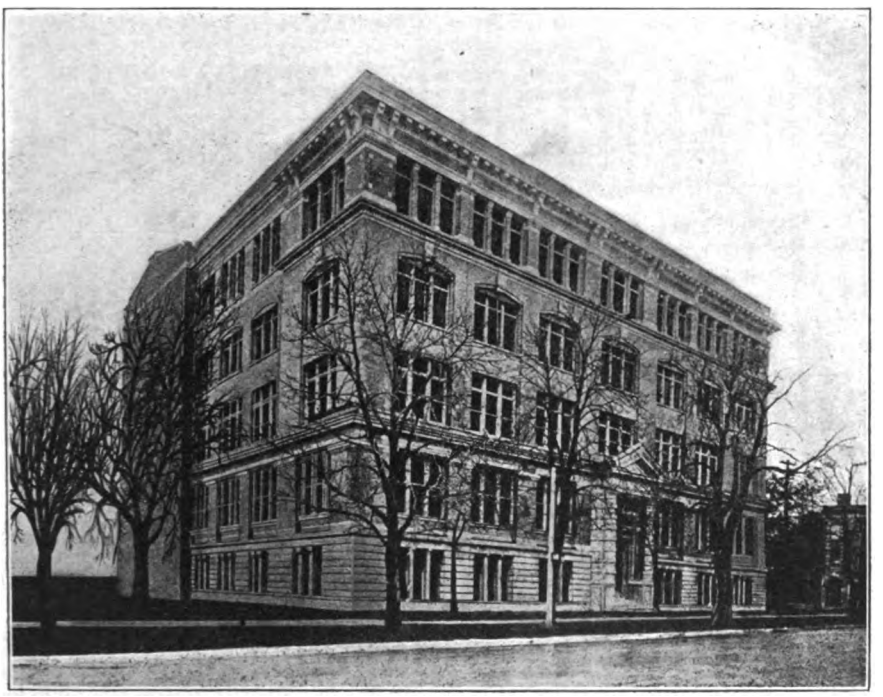
Report of the Ontario Veterinary College, 1913

To the Honourable JAMES S. DUFF, *Minister of Agriculture, Toronto.*

SIR,—I have the honour to submit the following report of the Ontario Veterinary College for the year ending 31st October, 1913.



NEW BUILDING, ONTARIO VETERINARY COLLEGE

110 University Avenue, Toronto, Canada

DIMENSIONS:
Cubic feet, 900,000; Floor space, 1 acre; Frontage, 134 feet; Height, 82 feet

The system of teaching is much the same as in previous years, yet some important changes were made in an effort to make all educational features of the College as practical as possible. For this purpose daily clinics were instituted, and students, after having been shown how to perform important operations in surgery, veterinary dentistry, examination of horses for soundness and kindred subjects by the teacher in charge of the work, were afterwards required to perform various operations before their classmates, but still under the supervision of the teacher. This method of training was highly appreciated by the students, especially as it prepares them in a more efficient manner for things to be met with from time to time in everyday practice. All other branches of the course were amplified and improvements made by new equipment which was introduced into the classrooms and laboratories when possible.

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TIME TABLE OF LECTURES AND DEMONSTRATIONS

The following programme of lectures and laboratory demonstrations was conducted at the times specified during the two terms of the College year:—

FALL TERM — FIRST YEAR

Hour	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
8-9 A.M.	Tutorial Class Room D	Tutorial Class Room D	Tutorial Class Room D	Tutorial Class Room D	Tutorial Class Room D	Tutorial Class Room D
9-10 "	Anatomy Room C	Sporadic Diseases of Horse Room C	Chemistry at University	Chemistry at University	Anatomy Room C	Anatomy Room C
10-11 "	Section A Laboratory Histology Room A	Section B Laboratory Histology Room A	Chemistry at University	Chemistry at University	Pharmacy Room C	Parasitology Room C
11-12 "	Section A Laboratory Histology Room A	Section B Laboratory Histology Room A	Chemistry at University	Chemistry at University	Zoology Room C	Materia Medica Room C
1-2 P.M.	Study	Study	Study	Histology Room C	Study	Study
1-4 "	Section B Laboratory Zoology Room A	Study	Study		Section A Laboratory Zoology Room A	
2-3 "	Study	Study	Study	Equine Dentistry, Room C		
1.30-3.30 "	Study	Study	Amphi-Theatre Clinic	Study	Study	
2-5 "	Section A Botany at University				Section B Botany at University	
4-5 "	Study	Study	Pharmacy Room C	Study	Study	

FALL TERM — SECOND YEAR

Hour	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
8-9 A.M	Tutorial Class Room D	Tutorial Class Room D	Tutorial Class Room D	Tutorial Class Room D	Tutorial Class Room D	Tutorial Class Room D
9-10 "	Materia Medica. Room B	Anatomy Room B	Pathology Room D	Physiology at University	Pathology Room D	Physiology at University
10.30-11.30 "						Anatomy Room D
10-11 "	Anatomy Room B	Sporadic Diseases of Horse. RoomB	Materia Medica Room B	Anatomy Quiz 10.30-11 a.m.	Sporadic Diseases of Horse. RoomB	
11-12 "	Contagious Diseases Room B	Cattle Diseases Room B	Contagious Diseases Room B	Bacteriology Room B	Bacteriology Room B	
1-3 P.M.	Dissection					
1-5 "		Dissection	Dissection	Clinic	Dissection	Dissection
5-6 "		Physiology at University				

SUBJECT TO CHANGE

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FALL TERM **THIRD YEAR**

Hour	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
8-9 A.M.	Tutorial Class Room D	Tutorial Class Room D	Tutorial Class Room D	Tutorial Class Room D	Tutorial Class Room D	Tutorial Class Room D
9-10 "	Materia Medica Room B	Anatomy Room B	Dairy Inspection Room B	Equine Dentistry Room B	Veterinary Jurisprudence Room B	Laboratory Pathology
10-11 "	Anatomy Room B	Sporadic Diseases of Horse Room B	Materia Medica Room B	Regional Anatomy and Surgery Room B	Sporadic Diseases of Horse Room B	Canine and Feline Diseases Room B
11-12 "	Contagious Diseases Room B	Cattle Diseases Room B	Contagious Diseases Room B	Bacteriology Room B	Bacteriology Room B	Zootechnics Room B
1-4 P.M.		Clinic	Section A Microscopic Laboratory Pathology	Section B Microscopic Laboratory Pathology		
4-6 "	Section A Laboratory Bacteriology	Section A Laboratory Bacteriology	Study	Section A Laboratory Bacteriology	Section A Laboratory Bacteriology	
4.30-6 "						

SUBJECT TO CHANGE

SPRING TERM **FIRST YEAR**

Hour	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
8-9 A.M	Tutorial Class Room D	Tutorial Class Room D	Tutorial Class Room D	Tutorial Class Room D	Tutorial Class Room D	Tutorial Class Room D
9-10 "	Anatomy Room C	Sporadic Diseases of Horse Room C	Chemistry at University	Chemistry at University	Anatomy Room C	Anatomy Room C
10-11 "	Section A Laboratory Histology Room A	Section B Laboratory Histology Room A	Chemistry at University	Chemistry at University	Pharmacy Room C	Parasitology Room C
11-12 "	Section A Laboratory Histology Room A	Section B Laboratory Histology Room A	Chemistry at University	Chemistry at University	Zoology Room C	Materia Medica Room C
1-4 P.M.	Dissection	Dissection	Dissection	Dissection	Dissection	Dissection
	Dentistry 4-5 p.m. Room C	Study	Pharmacy 4-5 p.m. Room C	Study	Clinic 4-6 p.m. Amphitheatre	

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SPRING TERM **SECOND YEAR**

Hour	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
8-9 A.M.	Tutorial Class Room D	Tutorial Class Room D	Tutorial Class Room D	Tutorial Class Room D	Tutorial Class Room D	Tutorial Class Room D
9-10 "	Materia Medica Room B	Anatomy Room B	Pathology Room D	Physiology at University	Pathology Room D	Physiology at University
10-11 "	Anatomy Room B	Sporadic Diseases of Horse. RoomB	Materia Medica Room B	Anatomy Quiz Room D	Sporadic Diseases of Horse. RoomB	10.30-11.30 Anatomy Room D
11-12 "	Contagious Diseases Room B	Obstetrics Room B	Contagious Diseases Room B	Bacteriology Room B	Bacteriology Room B	
1-4 P.M.	Section A Laboratory Histology or Pathology Room A	Section B Laboratory Histology or Pathology Room A	Section A Laboratory Histology or Pathology Room A	Clinic Amphitheatre	Section B Laboratory Histology or Pathology Room A	
5-6 "		Physiology at University				

SUBJECT TO CHANGE

SPRING TERM **THIRD YEAR**

Hour	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
8-9 A.M.	Tutorial Class Room D	Tutorial Class Room D	Tutorial Class Room D	Tutorial Class Room D	Tutorial Class Room D	Tutorial Class Room D
9-10 "	Materia Medica Room B	Anatomy Room B	Sporadic Diseases Room B	Horse Shoeing, etc. Room B	Study Hour	Laboratory Pathology or Milk Inspection
10-11 "	Anatomy Room B	Sporadic Diseases of Horse Room B	Materia Medica Room B	Regional Anatomy and Surgery Room B	Sporadic Diseases of Horse Room B	Canine and Feline Diseases Room B
11-12 "	Contagious Diseases or Veterinary Hygiene Room B	Obstetrics Room B	Contagious Diseases or Veterinary Hygiene Room B	Bacteriology Room B	Bacteriology Room B	Zootechnics Room B
1-4 P.M.	Study	1.15-2.45 p.m. Practical Work Amphitheatre	Clinic	1.00-3.30 Practical Meat Inspection 4 Students	1.00-3.30 Practical Meat Inspection 4 Students	
3-4 "	Lecture Meat Inspection Room B	Study	Lecture Meat Inspection Room B 4.30 p.m. to 5.30 p.m.	Study	Study	Stock Judging
4-6 "	Section B Laboratory Bacteriology	Section B Laboratory Bacteriology		Section B Laboratory Bacteriology	Section B Laboratory Bacteriology	

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During the year there were several changes in the College staff for various reasons, death claiming one of our most promising young men in the person of L. C. Hurd, V.S., B.V.Sc., who had previously acted most efficiently as Demonstrator of Anatomy, others withdrew on account of ill health or for private reasons. but they were one and all efficient teachers in their lines.

Eighty-three students having completed the course of study and otherwise fulfilled the requirements of the College were granted the degree of Veterinary Surgeon at the closing exercises of the college year and subsequently ten of them were granted the degree of Bachelor of Veterinary Science by the University of Toronto.

The College opened this year with a small increase of students over last year. The total number of students attending was also on the increase, there being 373 students this year against 363 last year. They came principally from the following countries in the order named: Canada, United States, Great Britain and other countries. It is interesting to note the gradual increase in attendance from this Province since the College was taken over by the Provincial Government. In 1908, in which year the College was taken over, 49 students registered from Ontario; in 1909, 69 students; in 1910, 74 students; in 1911, 83 students; in 1912, 85 students; and in 1913, 96 students.

The increasing demand for special veterinary training regarding the surgical and medical treatment of fur-bearing and wild animals in captivity led to the institution of a short course in the foregoing subject, and illustrated lectures were given by a veterinarian who has had many years experience in probably the largest zoological institution in North America.

During the year the College celebrated the fiftieth anniversary of its founding, thus marking an era in veterinary education in this country. Before another College term opens it is expected that the splendid new building being erected on University Avenue will be ready for occupation.

OPENING EXERCISES OF THE COLLEGE.

At the opening exercises of the College this year the students were addressed by the Venerable Archdeacon Cody and President Falconer.

Principal GRANGE briefly introduced the speakers.

ADDRESS.

ARCHDEACON CODY, TORONTO.

It is indeed an honor to address so vigorous and energetic a body of students as you are. The name and fame of the veterinarians of the Ontario Veterinary College, on the football field and in the general life of this large city, are well known. I hope that you will always maintain your prowess, not only in the field of sport, but in the scientific field which you are just entering. You are members of a College that has an ancient and honorable history. Not very many of our institutions here are fifty years of age; this institution is over fifty. Its splendid past will always be linked with the name of that great pioneer in the department of veterinary surgery, Dr. Andrew Smith.

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When, several years ago, I had the opportunity of visiting a number of institutions on the other side of the line as a member of the University Commission, it was interesting to hear the opinions that were expressed concerning our institutions in this Province, and no institutions seemed to be better known—more widely and favourably known—than the Ontario Agricultural College and the Ontario Veterinary College.

In connection with the investigations of the University Commission, made some six or seven years ago, certain conclusions were forced upon the Commission, and these conclusions were embodied in a report and submitted to the Provincial Government. I think nearly all of these recommendations have been carried out. They were seven in number.

The first recommendation was that the University of Toronto should establish a degree in Veterinary Science. It was felt that the standard of veterinary education in this Dominion would be elevated if the University drafted a reasonably stiff course and gave its imprimatur to a curriculum in veterinary science. This has been done, I am sure, with great advantage and help to the teaching staff; and it will impose a fresh responsibility upon those who have received the degree from our common Alma Mater.

The second: that the Government should establish a Veterinary College which would provide courses for the conferring of diplomas and also for the degree in Veterinary Science which the University of Toronto would confer.

The third was that the Government should seek to take over, if satisfactory terms could be arranged, this the Ontario Veterinary College, that had come down from the days of the old Board of Agriculture, through the days of the Agricultural and Arts Association, and then to a private corporation—The Canada Veterinary College. It was felt that the importance of the science was so great, and was developing so rapidly, that only the support of the State—I mean the financial support—would suffice to give the proper equipment.

The fourth recommendation was: that the Government should conduct this college on lines similar to those on which the Agricultural College at Guelph is conducted. May I say in regard to this last institution that when some of us Commissioners visited the University of Wisconsin we were taken to see the Department of Agriculture. We were introduced to the Dean of the College, Professor Henry, and were described as hailing from the Province of Ontario. The Dean said: "Well, gentlemen, I am afraid there is little I can show you at our institution; it is small as compared with your own magnificent institution at Guelph." We took the compliment as a matter of course, but I am bound to confess that not one of us had, up to that time, been to see our own Agricultural University at Guelph. As a result we made up our minds to visit Guelph as soon as we got back from our visit. Sometimes one has to go abroad to learn the real value of the advantages offered us at home. What is true of the Agricultural College of Guelph is in a large measure true of this College, and will, I believe, be increasingly true. What has been done for agriculture in the Province of Ontario by the College at Guelph will, I feel sure, be done by the Ontario Veterinary College.

Then, in the matter of administration, it was felt advisable that the College should be brought under the immediate control of the Minister of Agriculture, and that the Minister of Agriculture should be aided by an advisory council, made up of those officers best able to further its best interests. This has been done.

Another most desirable feature was pressed upon us during our investigations on the other side of the line and was supported by the requests and demonstrations of those in touch with the College here, and that was, the lengthening of the

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course to three years. Some of the advanced students had to go across the line for their higher work, and it was felt that this Province—with its great wealth of horses, and its live stock development—should provide an amply and fully rounded course in Veterinary Science. That, as you know, has been done, and I am sure that no student really regrets the extra year that has to be spent. No time could be better spent than that devoted to preparation for your scientific profession.

The last recommendation was that there should be a new building for the College erected in as close proximity to the university as possible, so that the existing ties of federation between the College and the University might be strengthened; that lectures could be taken in common by you and the university students; or, that the lecturers at the university could, without much inconvenience, give lectures at your institution.

Now, all these several recommendations mark the beginning of a new era in the history of veterinary science in the Province of Ontario. I am sure that these are only starting points and that you will forge ahead year by year. What has been done in the past by this institution will be carried on in a still greater degree of efficiency in your larger and better premises. It is perfectly true that it is on the ability of the teaching staff of the College that the real progress of the institution depends; but the teaching staff can do their work, and you students can do your work more effectively when you have the best possible surroundings and the best possible equipment. There will be less waste, and less friction. The other day in one of our papers it was stated that a distinguished veterinary surgeon, Major-General Smith, presenting a report on veterinary science at a meeting of the British Veterinaries' Association held in Manchester, referred to the general advance in this branch of science; and particularly to the Ontario Veterinary College with its three year course. Then—and this is of special significance to us—he made the statement that in his judgment this colony was ahead of the motherland in the practical education of students. You are developing the laboratory side of your work. Everybody knows that theory must be translated into practice or else it will be forgotten, and that practice is not of so much value without a proper understanding of theory. You are seeking to combine the two elements of theory and practice by your development of the laboratory method of teaching.

A veterinary surgeon is a member of a profession, and to be a member of a profession means that there are certain standards to which we have to rise. There is a certain standard of professional etiquette, and there are certain standards of honor that must be observed. All members of the profession must feel that the honor of the profession is in their hands, and that any departure from the strict code of professional etiquette disgraces not only the individual, but also the whole profession represented. When any body of men are organized for the common weal of their profession, there are these standards of honour, these standards of etiquette. There is something beyond the commercial side of things.

But above all things—what a high standard your profession should set before you. You will never forget that the whole agricultural prosperity of this country, this commonwealth of farmers, with their horses and cattle, live stock and allied interests, is largely dependent on your profession. The closest relation exists between the live stock and the strictly agricultural interests. It is doubtful if one can exist without the other. You also have it in your power to benefit all animal life as it affects the home. As Dr. Grange has pointed out, the scope of veterinary science is becoming wider and wider. You are not only to administer specific assistance, or to mend broken limbs, but you are to follow in the wake of all

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Model of a horse 4 feet high which separates into 97 pieces, showing over 3,000 important points for illustrating Anatomy. It is a most useful aid in teaching.

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progressive scientists of this generation. You are to seek to prevent *disease* rather than merely to *cure* it. This is the tendency of the medical profession as well as of your own. You are to try and save your clients from loss by the economical treatment of their animals, and by combatting the plagues that sweep away animals. You will have to do with food inspection; with milk inspection. All subjects connected with the food of the people will more or less be in your hands. In fact, gentlemen, the trained sanitarian may be as well drawn from your ranks as from the ranks of the medical profession. All modern sanitary sciences, as part of your profession, touch the welfare of the people at a hundred points that were not dreamt of a generation past.

If this is the case; if the standards of the profession are so high, and if the opportunities of the profession are so great, what manner of men ought you to be? You are going to care for the health of the animals, upon which to a great extent the health and lives of the people of this Dominion depend. This is the most interesting period in the history of the Dominion. No one can tell what we in Canada may do year by year at this formative stage. In every walk and calling in life a man may leave his mark and may feel that in his own life time he did his part towards the development of his country. You can *see* results. You must watch your opportunities. What are you here, in this institution, going to do as trained servants of the future to build up this Dominion so that it may be what is predicted for it? Gentlemen, the value of a college training will certainly be of benefit to you. You will have the mastery of a certain amount of knowledge. If a man comes away from college and has no mastery at all over his intellectual resources, his course certainly has failed to do that for which it was intended. You must have mastery and control over your intellectual resources, you must know how to grasp central ideas and arrange facts round central principles. Sound education enables you the easier to face new situations. You will be constantly confronted by situations in your profession that have not been foreseen in college, but if you have a reasonable control over your sources of knowledge, and if you have this disciplined mind that is able to see principles or deduce principles from facts, you will be able to face and solve almost every difficulty that can be presented. And above this there will be an element of culture that gives a man a wider outlook. Can any man be satisfied simply to become master of his own profession? A man ought not only to be an efficient man in his profession, but he ought to be good company for himself. When old Senator Leland Stanford was stating the purposes which he hoped the new university he was founding would keep in view, he mentioned this among other things:

"I want the students to be trained to be good company for themselves."

There is much wisdom wrapped up in that. One great danger in our own day is that we shall be so absorbed in our undertakings that we tend to become machines. Never let us lose our wider faculties; never let our humanity be dried up; let there always be a reserve of humanity: You know the old French proverb: "Born a man, died a grocer."

The idea is that the man may become so identified with his business that he loses his broader human interests. You want to be a man while you are a veterinary surgeon, keeping free the springs of a liberal humanity while you are engaged in your own professional duties.

Every man who makes a success of the work that lies before him realizes that there are one or two fundamentals that he must understand and practise. No

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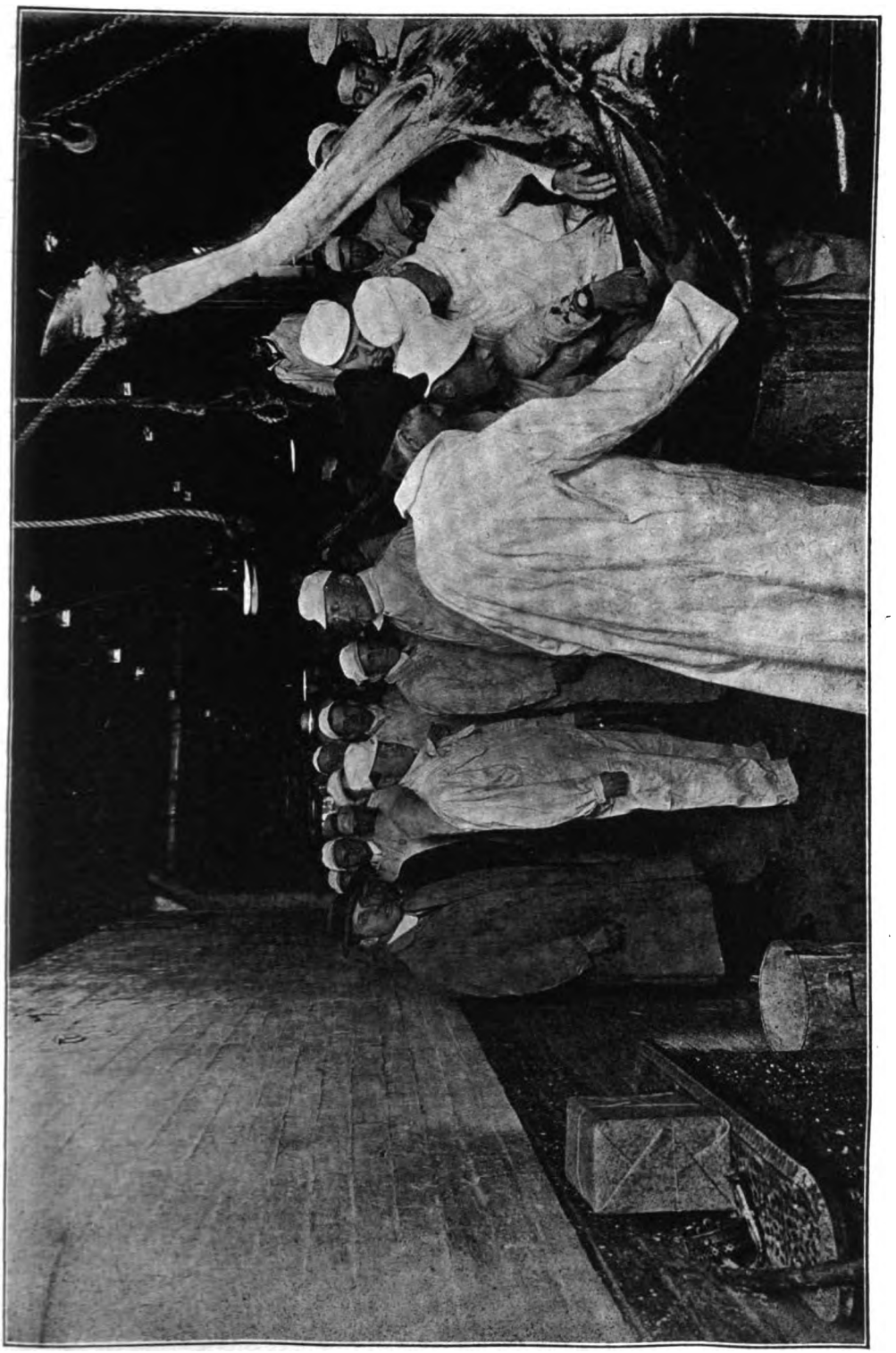

A small section of the 1st year class in dissection.

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man can be a success as a student or as a professional man unless he is first and foremost scrupulously honest. He must be honest in study, honest in the use of his time, honest in the use of his books, honest in the time and thought and energy that he devotes to his profession and his clients. Honesty is just a broader application of the wider principle of truth. We do not want the mere smart man. Some years ago Mr. Kipling addressing the students of McGill University gave them some excellent advice, and the heart of the advice he gave them was this: "Gentlemen, whatever you are, don't be smart." You know what smartness means. It is something a great deal different from being alert; it denotes sharp moral turns; it means trying to get ahead of some one else by being unscrupulous. I believe that in the Dominion of Canada we are to-day not so liable to some of the grosser sins as we are to the subtler evils of untruthfulness and smartness. Don't let us be "smart." If we are to be successful the first requisite must be strict and absolute honesty. A distinguished writer divided people into those who were honest, dishonest, and legally honest. What I particularly wish to emphasize is: that absolute honesty goes beyond what the law requires. Hard work is a second element in true success. There is a good deal of truth in the old definition of genius—"genius is the faculty of taking infinite pains." It is not an absolutely correct definition, but there is a great deal of truth in it. The man who takes infinite pains can accomplish more than one who is brilliant, but erratic and lazy. There is no royal road to success; you do not get to the goal in a leap, but you get there for the most part by hard work, and you will get to your goal and success in your profession, and be of service to the community, by good old-fashioned hard work. You know there are people who are perfectly willing to get to the top, but if the elevator is out of order they will not trudge up the stairs. There is plenty of room at the top of your profession, but the elevator is not running. Every man who is going to get to the top has to climb the stairs step by step.

A man once asked a student: "What are you going to study now that you have left college?" The student replied: "I am going to study medicine." His friend said: "Don't you think the profession is overcrowded?" "Yes," said the student, "I have no doubt it is, and I am going to study medicine nevertheless; I just want those who are in the profession to look out for their laurels." That is the right view. There may be many in your profession, but go ahead and make those who are already in it look out for their laurels when you are once in.

Lastly, and this is almost unnecessary to say: In every profession, and in every calling of life, that which counts for more than anything is a man's character. It is one of the commonplace remarks in life, but the commonplace things in life must be said over and over again until we really believe them. It is a man's character that tells more than anything else in his profession. You create by your character an atmosphere of confidence in yourself. I do not know exactly how it may work out so far as horses and cattle are concerned, I do not know whether they can estimate human nature, but I fancy they are able to infer something as to one's character. Certainly a large measure of a doctor's success is due to the amount of faith his patients have in him; it is more efficacious than pills and medicine. You must so conduct yourself, and so form your character that the whole community will have confidence in you as a man of sterling integrity.

I wish you all possible success in your profession. I trust you will have a year of hard work, and plenty of enjoyment in the work; success in your examinations, and success in the wider field that lies before you.

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ADDRESS.

PRESIDENT R. A. FALCONER, TORONTO UNIVERSITY.

I came here to-night for two reasons: First, because I have always been glad to come to the opening and closing of the Veterinary College, if off duty; and, secondly, because I should hear Archdeacon Cody, whom we always listen to with a great deal of pleasure and profit, and his speech to-night is one you can well take away with you. He has given you so much good advice that it would not do for me to attempt to give any more of that kind. I will, however, just say briefly that you are to be congratulated on what you have as a college already obtained, and on what you have in prospect. Coming down town to-night I passed the new building, which I hope you will be able to get into next year, and your entry into that new building will, I believe, mean the setting forth on larger expansion in every way than this college has ever had yet. How rapidly things grow; we hardly realize where we are. The Archdeacon referred to that to-night. This last summer, during my holidays, I turned to the old history of Canada and amused myself a good deal with some of the original writings of the older days; and to-night, before coming down, I was reading an interesting book of early days in Toronto; and one cannot help considering the contrast that exists between that period, 120 years ago, and the present. Here, 120 years ago at the outside, the Governor and staff were living in canvas houses, boarded up outside to protect them from the weather, with a mere handful of people. The Governor had to oversee a spacious territory, and travel great distances along trails, there being no roads; just a handful of people there was during Governor Simcoe's time. In that period the whole population of settled Ontario as we now know it, that is exclusive of Quebec west of the Ottawa River, amounted to less than ten thousand people—less than the population, I was told a few weeks ago, which you can find between Cobalt and Cochrane in the north country. They tell us that starting from Cobalt and going to Haileybury and northward to Englehart, in the district around there you have enough people to have a representative in the Dominion Parliament, some 25,000 people. But one hundred and twenty years ago there were not twenty-five thousand people in the whole of Ontario, not anything like twenty-five thousand people. Now look at the conditions one finds in Ontario to-day. No one thinks of the distance in coming to this College, already famed as being one of the greatest educational institutions of veterinary science on this continent. A splendid thing to contemplate is the development of this institution, but the greatest development has really come in the last ten or fifteen years and to-day we are in the very midst of it. When we look forward it is almost impossible to predict what may be achieved from the mere beginning of some years ago, and we are beginning where others left off, and they were not content to take second place, therefore we ought to enter upon the upbuilding of this College in a spirit of earnestness, as has been said here to-night. It is not an easy task, no, not by any manner of means; it is a very difficult task, and you will get perhaps many temporary set-backs. If, however, everybody would work just a little, do a good average day's work, the whole world would be changed completely. *A little work well done produces tremendous results.* We are not expected to kill ourselves with work, but we are expected to work healthily to the limit of our ability. It does not require a very great strain on most people. We do our average work unconsciously, and the results as a rule are surprising.

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One day last summer I was invited by some gentlemen to go fishing on the ocean in a large yacht, in which we had also gasoline power. When we got outside the harbor it was pretty windy and some of the occupants of the yacht were manifestly indisposed. I hope you won't have that sort of a day. I had determined to catch one fish anyway, if only one. However, we were told it was too rough to catch many, so we moved in to the lee shore and were there told that fish were never caught on that bank. On starting out we met another party and they told us if it was possible to catch fish at all they would be caught on the very bank we were leaving. Now the moral of this tale is: You are not going to catch much fish if you are turned round, driven here and there by every impulse; you have got to be fairly steady. If you allow your animal spirits to carry you away you won't catch much fish of the right kind; and if you divide your attention between too many interests you won't catch much fish. You will always be meeting with contrary currents and complex questions in life, which cannot be properly dealt with unless you restrain yourselves. I do not say all men need it, but certainly some men need a great deal of restraint. To do good work you must have calm and quiet. As the Archdeacon has said, you need to understand before you start out just what you want to do, and then set to work to do it. A man that is all the time being pulled hither and thither, going here and running there, swayed by passion and impulse, will go away from the College in all probability not having accomplished very much.

I did not expect to speak at any length, and so will close with wishing that you will all have a most successful winter; do your proper share of work, and in your hours of recreation remember what the Archdeacon has said, and make the recreation such as will strengthen both mind and body.

Dr. D. King Smith: Before closing I would like this meeting to express to Archdeacon Cody and President Falconer a vote of thanks for their addresses this evening. I am sure I have appreciated them myself, and all present must go away with pleasant recollections of the meeting. To me, personally, they are exceptionally interesting, for you know that this is the last year of meeting in this College, and as my father was associated with the College for some forty-five years, and I have been for some seventeen years, it is indeed a pleasure to me to think that between us, our associations with the college cover a period of some fifty-six years. It is a long time in the history of any college, and probably no college in Toronto can record so unique an incident. We have been going on for years without an interruption, and while we are this year using this building we are looking forward to a great advance. Here is the nucleus, and it will grow and thrive just as our efforts are put forward to keep it in the front rank; and it is my earnest hope that the College will be in the future as successful as it has been in the past. Our many friends recognize that what we have done in the past may be good auguries for the future. It gives me much pleasure, therefore, in moving to Archdeacon Cody and President Falconer a vote of thanks for their addresses.

Dr. L. T. Addison: It gives me very much pleasure in seconding the vote of thanks moved by Dr. D. King Smith. The words of comfort given to our students by Archdeacon Cody, whom I know very well, and President Falconer, who has come to us to-night as a student, will be treasured by the students present, not only for guidance through their college career, but when they start out on their professional duties, and have, as these gentlemen have told us, to battle with the ups and downs of this life, which philosophers tell us are the essentials of success.

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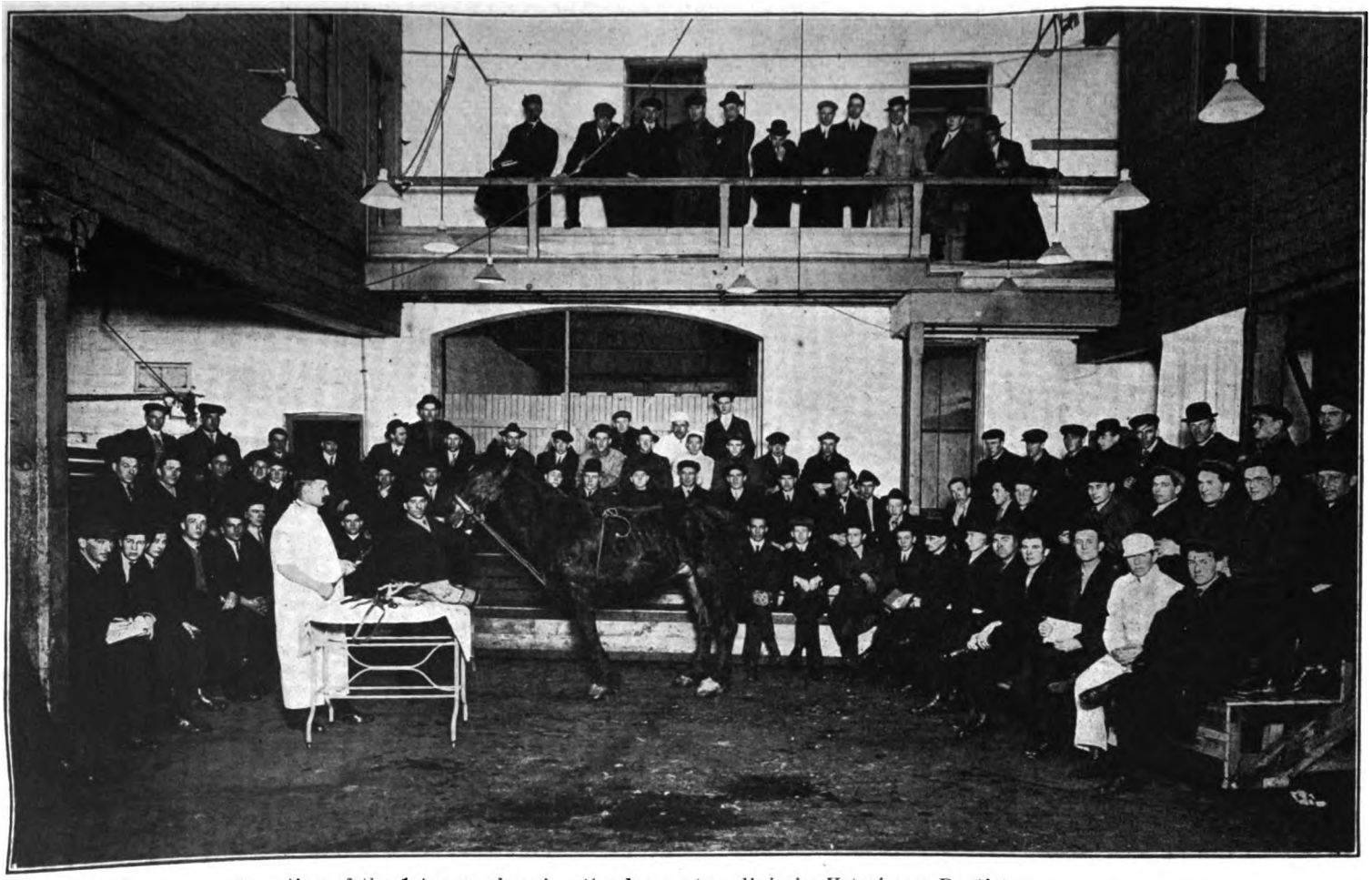

A section of the 1st year class in attendance at a clinic in Veterinary Dentistry.

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DR. GRANGE: Before putting the motion I wish to say a word or two to you. I have had something to do with this college for a great many years. I was demonstrator of anatomy here about forty-five years ago, so that I will leave these buildings with sincere feelings of regret. But the development and growth of the animal industry has made it imperative to find larger quarters. I used to demonstrate in the cellar down below. I spent a good many very pleasant years there. After I got out of the cellar I was called to go elsewhere. Probably we all understand that it is not joy for me to leave these buildings; although, as we are going into somewhat, perhaps, more advanced work, we will require larger buildings.

I now take the greatest pleasure in putting the motion for a vote of thanks to Archdeacon Cody and to President Falconer.

The motion was heartily carried.

PRIZE ESSAYS.

The Committee of the Faculty in charge of the Scholarship essays awarded the prize for the first year essay to H. E. Batt and the prize for the second year to A. H. Hunter.

These essays present so many points of interest to laymen as well as professionals, that it has been considered well to include them in this report.

ESSAY OF THE FIRST YEAR STUDENT.

TENOTOMY OF THE PERFORANS AND PERFORATUS TENDONS OF THE ANTERIOR LIMB.

The animal on which the above operation was performed was an aged gelding. The horse when brought to my preceptor for treatment was absolutely useless, the limb being in such a state of flexion that the animal walked on his toe and the foot was deformed as the constant walking on the toe had caused the heels to become much elongated. In the anterior portion of the fetlock joint there was a very marked protrusion of the distal end of the large metacarpal bone caused by the constant flexion of the joint and the animal's weight. When standing still the horse stood with the affected limb slightly flexed at the carpus, and barely touched the ground with the toe. On being made to move he did so with great difficulty, getting his hind limbs well under him, and making a long hopping kind of step with the sound limb, thus taking as much weight as possible off the injured leg, which was moved forward with a quick short step. The horse had been subjected to severe work, hauling a gravel wagon, which had resulted in an attack of tendonitis involving all the tendons below the carpus as far down as the sesamoidean bones. This condition had apparently been somewhat neglected, and the constant state of excessive flexion in the phalangeal articulations had caused a shortening of the tendons of the flexor pedis perforatus, flexor pedis perforans and the check ligament. As a result of the previous inflammation the

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A section of the 2nd year class assembled for practical work in Histology.

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tendons had become united with fibrous tissue, so much so that on manipulation no division between them could be felt. The skin on the posterior and lateral surfaces of the metacarpal was very much thickened, and showed signs of having been blistered some time before.

Under these circumstances the severing of the perforans and perforatus tendons was decided upon, and under my preceptor's direction the following operation was performed:

The following instruments and equipment were made use of: Clippers, razor, straight pointed bistoury, hoof clippers, paring knife, antiseptic soap, dish of antiseptic sol. (2½ per cent. solution of carbolic acid in distilled water), absorbent cotton, antiseptic dressing powder and roller bandages.

Before starting on the operation proper, the hoof was attended to, the excessive elongation of the heels was reduced and the foot was trimmed into as good a shape as possible under the circumstances, care being taken not to take too much off the heels, which were again cut down a little 10 days after the operation.

The restraint used was a twitch, the operation being performed with the animal standing, the part being injected with a 4 per cent. solution of cocaine which gave a complete local anæsthesia, for during the whole proceedings the horse gave no evidence of pain whatever. The instruments, etc., were assembled close at hand, the knife having been boiled for half an hour in a 2½ per cent. solution of carbolic acid and left in the solution until it was used. I took particular care that my hands were clean, and kept them rinsed off with a 2½ per cent. solution of carbolic acid in distilled water, doing this several times during the course of the operation.

The whole middle thud of the metacarpal region was clipped and shaved, then washed well with the antiseptic solution and soap. The next step was the injection of the anæsthetic, which was 10 c.c. of a 4 per cent. solution of cocaine in distilled water injected along the metacarpal nerves below the connecting branch. The needle was previously sterilized in a flame, and the syringe had been boiled for half an hour. Each side of the part was then massaged to help distribute the cocaine among the tissues. The field was then rinsed in alcohol and tincture of iodine was applied around the point of incision.

The division of the tendons is effected at a point 2 inches below the middle of the metacarpal bone. This point is chosen as it is just above the upper part of the sesamoidean synovial bursa and is just inferior to the downward extension of the carpal sheath. The incision is made on the internal aspect of the metacarpal region to avoid the great metacarpal artery which passes down on the internal surface of the limb, and in working from the internal surface its position is more clearly determined, and it is not so liable to be cut as if the knife were passed towards it from the external aspect of the region. The point of entry is in the groove between the perforans tendon and the suspensory ligament, keeping rather to the posterior edge of the groove to avoid the metacarpal artery vein and nerve which passes down rather to the anterior portion of the groove.

The incision was made from above downwards, and the blade of the bistoury was inserted flatwise with its cutting edge upwards. The inward course was continued until I could feel the point beneath the skin on the external surface of the region. The knife was by this time so far in that its cutting edge was beyond danger of cutting the artery when it was turned over with its cutting edge forward and the work of severing the tendons began. In this case the fibrous tissue which united the tendons was so thick that it made progress rather difficult and slow,

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as little or no outlines could be felt. The knife made a grating sound as it severed the fibres, and one would almost think that it was grating on bone. As the knife passed through the tendons I had an assistant put his hands below the carpus and in front and push the knee backwards so as to strain the tendons tighter, and when at last the final fibres were severed there was a marked sinking of the heel and the cupal flexion was very much less. We then both got at the limb, and put considerable force to bear on it, so as to help break down the adhesions. The part was then sponged off with antiseptic solution, and a dry dressing was applied. There was very little hemorrhage.

I left the dressing on for 48 hours, then took it off, and found everything going on well. There was a thin watery reddish serum exudating from the wound, and the part was swollen. I pressed out all of this fluid I could, and could clearly feel the severed tendon ends with about an inch space between them. After carefully washing the area in an antiseptic solution, I put on fresh bandages and returned horse to the box stall. The fluid continued to flow from the wound for about 10 days, when it gradually became less until about the 15th day the discharge stopped, and the wound closed up and healed. The part was dressed each day and cold water applied with the hose for half an hour at a time. Also I exercised the horse a little every day, hoping by so doing to aid the breaking down of adhesions. The horse for the first week or two was very lame, but after the wound healed the lameness gradually left, and the leg was returned to its natural position. There seemed to be some little difficulty in flexion which would naturally be expected, but the impediment was slight. Backing seemed to bother him most, although he could back all right except that he dragged the foot. Two months after the horse was fit to work, and was sent to the country, where I heard he was doing good work on a plow. As to whether he would have been any use in the city I do not know, but at any rate the operation transformed him from a useless wreck into a useful animal on the farm. H. E. Batt.

ESSAY OF THE SECOND YEAR STUDENT.

Septic Arthritis.

This case of Septic Arthritis, or Joint Ill, occurred in a Clydesdale filly that was foaled in the open, and whose navel did not receive any attention after foaling.

Four days after birth the foal was injected with a vaccine of Streptococci organisms as a prophylactic against Joint Ill. The dose used was 350 million killed Streptococci. The vaccine itself was manufactured from four strains of Streptococci organisms isolated from four cases of Septic Arthritis.

A week after this injection we were called to see the foal, it being reported that it had suddenly "taken sick." On arrival we found the foal to have a temperature of 104°F., dull, disinclined to suck the dam, and a slight mucous discharge from both nostrils. We diagnosed the case as a "simple cold," or Rhinitis. Fearing that this was the forerunner of Joint Ill, we gave the foal an injection of a vaccine composed of Streptococci 50 million per cubic centimeter and Colonoid 100 million per cubic centimeter. On account of the foal having an injection a week before, we increased our usual initial dose of one cubic centimeter of vaccine to

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one and a half cubic centimeters, thus giving in all 150 million Colonoid and 75 million Streptococci.

The Colonoid bacillus (in the vaccine) was obtained in pure culture from both synovia and blood of colts affected with Joint Ill, and was subsequently employed in the vaccine. Orders were left with the owner to keep the bowels open, and we recommended for this raw linseed oil in doses of two ounces once daily.

On the following morning we called and found the foal very distressed. The bowels were normal, but both lungs were congested, and also a hard swelling had appeared over point of Os Calcis on the right hock. We diagnosed the case as Septic Arthritis and Pulmonary Congestion. A sinapism of equal parts of mustard and flour, mixed with a small amount of cold water, was applied on the body over the lungs and well rubbed in with cold water. We instructed the owner to inform us if the foal did not improve, and told him that we would call in four days, unless requested to call sooner.

Receiving no information during the intervening days, we called on the fourth day, and found the foal much improved, although there was still a slight congestion of both lungs and a temperature of 103 2-5°F. We applied a sinapism similar in composition to the one mentioned previously, and also injected 150 million killed Colonoid organisms and 75 million killed Streptococci. Two ounces of tincture of camphor were left with directions to give thirty drops thrice daily in oil or milk, and also a liniment to rub on the right hock (which was swelling gradually, although the foal did not evince much pain). The composition of the liniment was as follows:—

Liquor Ammonia Fort., ℥ss.
Turpentine, ℥j.
Methylated spirits, ℥ ij.
Water, ad. ℥ vj.

We directed the owner to rub the liniment well into the skin once daily, until blistered, and then stop using it.

On making a call five days later we found the left hock to be badly swollen, tense, and painful. Also the foal had a temperature of 104°F. and no sign of pulmonary congestion was evident. The foal was unable to walk (except with great difficulty) and spent a lot of time lying down. The swelling of the right hock was now quite soft, due to the effects of the liniment. We gave a further injection of 250 million killed Colonoid bacilli and 125 million killed Streptococci and discontinued the use of the tincture of camphor.

The condition of the foal remained about the same for five days, and on the fifth day it suddenly became worse. The swellings of the hocks were so painful now that the foal could not rise, unless assisted, and we decided to apply Antiphylogistine to them. This was done daily for four times, but it gave very little relief.

Not noticing a change for the better we decided upon aspirating both joints. A glass hypodermic syringe and two needles two inches long were sterilized and laid by in a sterile container until needed.

The foal was thrown on its left side and held down by two assistants. The inside of the left hock and the outside of the right hock were selected as being

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A section of the 3rd year class assembled for practical work in the bacteriological laboratory.

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the most suitable spots from which to enter the joint cavity, and a space about two inches square was clipped and shaved on each. Tincture of iodine was applied as a disinfectant to each area. The needle was next passed through the joint capsule into the joint cavity, and as no synovia would flow the syringe was attached and the synovia was aspirated. We removed about an ounce from the right hock and half an ounce from the left; the synovia from both hocks being very thick and cloudy. The punctures left by the needle were coated over with Colodion with 15 per cent. of iodoform dissolved in it. Later in the day the joints were well painted over with tincture of iodine as an absorbent, and this was done for three succeeding days but to no advantage. The synovia from the left hock was twice aspirated before the excessive secretion was checked.

The foal soon started to pick up in flesh, and in two weeks it had gained considerably. There still remained some swelling in the hocks, and to reduce this an absorbent of—

Potassium Iodide, ℥ iv.
Iodine crystals, ℥ ij.
Camphor, ℥ j.
Methylated Alcohol, ad., ℥ iv.

This mixture was applied every third day for four times, rubbing it well in with a stiff brush. This acted very well; the swellings gradually being reduced in size, and when last seen there was only some slight swelling in the left hock. The foal made an uneventful recovery.

Results of Investigations Regarding the Etiology of Septic Arthritis in Foals.

Probably no disease of the newly-born foal has become more prevalent during the last few years in this country than Septic Arthritis, or Joint Ill. This disease manifests itself in the foal within a short time after birth, but may not do so until the foal is several weeks old.

The micro-organism responsible for this affection has not been recognized. Various bacilli and cocci have from time to time been isolated from cases of Septic Arthritis, notably the Bacillus Bipolaris Septicus, Bacilli Coli Communis, Micrococcus Tetragenus, Streptococci pyogenes and Staphy-lococcus pyogenes Aureus. During the summer vacation I was in a district where the disease was fairly common and was enabled to keep a number of typical cases under my observation.

Twenty-three such cases were treated and all symptoms were noted. Fourteen cases did not have the navel dressed at birth, and of these six were foaled in the stable. Eleven cases had the navel entirely healed up, there being no discharge of urine or pus through them to retard the healing process. The average first temperature recorded was 103°F. and the average age at which the first symptoms appeared was nine days. There were ten cases in which the foal showed typical symptoms within a week's time after birth, while one did not show any symptoms until thirty-eight days old.

During the summer we obtained from foals suffering with typical cases of Septic Arthritis, several cultures of blood, and also of synovia aspirated from swollen joints, using strict precautions against contamination. The synovia in all cases

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was thick, turbid, and when allowed to stand it coagulated. On examination with direct smear stained with methylene blue, leucocytes and fibrin were demonstrated, thus showing inflammatory exudate. On examination of the majority of the cultures the bacillus Colonoid was found present. A few of the cultures, in addition to the Colonoid bacillus, showed Staphylococci and long-chain gram-positive Streptococci. These cultures, however, were obtained from foals that had been infected for a considerable time. The supposed part played by these pyogenic micro-organisms is "secondary invader," and their presence is due, no doubt, to the lowering of resistance in the foal's body by the toxins of the bacilli Colonoid. This bacillus was found in pure culture in all except three cultures.

Morphology and Cultural Characteristics of this Organism.

Morphology and Staining.—From culture the organism resembles a diplococcus and a short plump bacillus with rounded ends measuring about 1 m.m. in length and 0.5 m.m. in width. Staining irregular with Hoeffler's methylene blue, and also tendency to stain more deeply at ends. It is gramnegative.

Sporulation.—No spores produced.

Motility.—True motility was not observed in loop from 36-hour-old agar slant culture.

Petri-dish Culture.—Surface colonies 18 hours old are round, measuring from a pin point to one-half millimeter in diameter. The colonies are, to the naked eye, glistening, homogenous, and transparent to direct light.

Gelatin.—Not liquified.

Broth.—In some cases gave heavy surface growth with sediment at bottom.

Milk.—Not coagulated on being incubated 36 hours at 37°C. and exposed to room temperature for 36 hrs., and at the end of reaction is alkaline to litmus.

Agar Slant.—Streaks of the bacillus on agar slant incubated for 36 hours at 37°C. are very characteristic. The growth becomes dull and usually develops thin wrinkles near the drop of condensation.

Physiology.—Aerobic and facultative anaerobic Dulcite, Mannite and Glucose are fermented with production of both acid and gas. It does not ferment. Lactose, Saccharose or Raffinose, but fermentation tests on the latter ones have not been fully worked out. There was a characteristic surface growth on the surface of the fluid in the closed arm.

Indol was not produced, neither were nitrates reduced.

Table I. gives results of different tests carried out with various strains of the organism.

This bacillus Colonoid is remarkably similar in size and characteristics to a bacillus isolated by E. S. Good and L. S. Corbett of the Kentucky Agricultural Experiment Station at Lexington, from cases of infectious abortion in mares and jennets. Further work is being done, however, along the line of differentiating the two organisms.

A vaccine of Colonoid bacilli and Streptococci was used during the summer with good success. Strains from several cases of Septic Arthritis were employed in making the vaccine, the strength of which was 100 million Colonoid bacilli and 50 million Streptococci per cubic centimeter. One cubic centimeter was the usual initial dose, followed in five days with two cubic centimeters, then three and four cubic centimeters were injected at five day intervals again. Tincture of

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camphor was also employed as a stimulant, using doses averaging thirty drops thrice daily in oil or milk. Practitioners who have used this vaccine report good results following its use.

TABLE I.

Number of Strain	Glucose	Mannite	Dulcite	Saccharose	Lactose	Raffinose	Milk	Gram	Indol	Nitrates	Gelatin	Motility
2	A G	A G	A G	—	—	—	Alk.	—	—	—	—	—
3	A G	A G	A G	—	—	—	Alk.	—	—	—	—	—
4	A G	A G	A G	—	—	—	Alk.	—	—	—	—	—
5	A G	A G	A G	—	—	—	Alk.	—	—	—	—	—
8	A G	A G	A G	—	—	—	Alk.	—	—	—	—	—
9	A G	A G	A G	—	—	—	Alk.	—	—	—	—	—
10	A G	A G	A G	—	—	—	Alk.	—	—	—	—	—
12	A G	A G	A G	—	—	—	Alk.	—	—	—	—	—

A = Acid Production. G = Gas. C = Clot.
Alk. = Development of alkalinity and non-curdling of milk.
— In Saccharose, Lactose and Raffinose = no change.
— Gram = Gram negative.
— In Indol = no indol produced.
— In Nitrates = no reduction.
— In Motility = absence of motility.
— In Gelatin = no liquefaction.

HISTORY OF STRAINS.

2—From Filly with Septic Arthritis, 41 days after first symptoms were noticed.
3—From Filly, 33 days after first symptoms.
4—From Foal, 29 days (about) after first symptoms.
5—From Filly, 23 " " " "
8—From Filly, 11 " " " "
9—From Gelding, 11 days " " " (blood)
10—From Gelding, 11 " " " " (synovia)
12—From Filly, 18 " " " "

A full account of the bacilli resembling the Colonoid may be found in "The Journal of Infectious Diseases," Vol. XIII., No. 1, July, 1913, pp. 55-68.

I am indebted to Dr. Schofield for making the various examinations of cultures sent in, and also for determining the cultural characteristics of the organism.

A. H. HUNTER.

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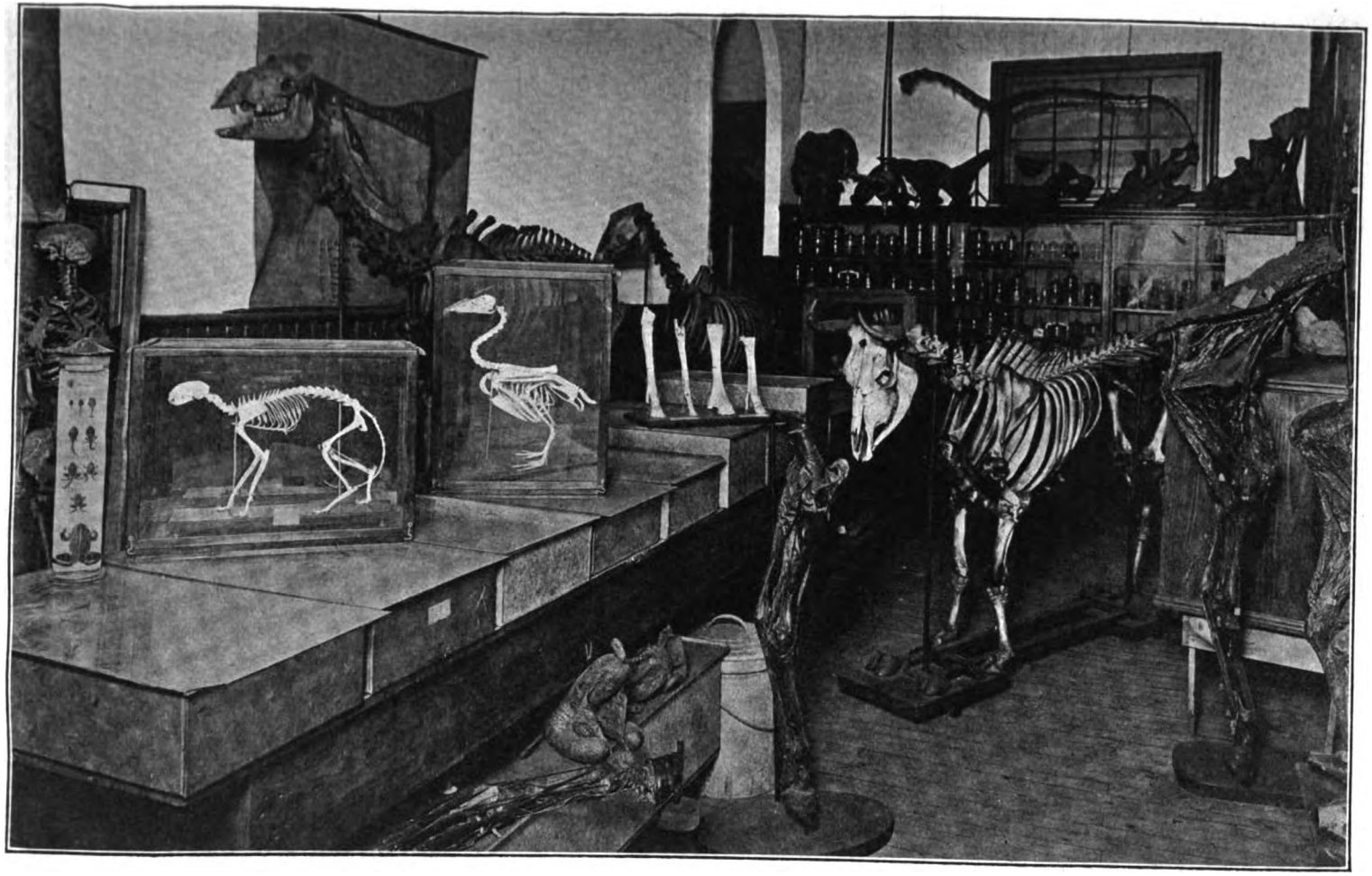

A few specimens in the College Museum.

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ALUMNI ASSOCIATION.

During the annual meeting of the American Veterinary Medical Association held in Toronto in August, 1911, a special meeting was held at the College for the purpose of forming an Alumni Association of the graduates of the Ontario Veterinary College.

Initiative steps were taken in forming the society and the following officers elected:—

President—E. A. A. GRANGE, V.S., M.Sc,, Toronto.
First Vice-President—J. HAWKINS, V.S., Detroit.
Second Vice-President—J. W. SALADE, V.S., Auburn, Penn.
Sec.-Treasurer—W. J. R. FOWLER, V.S., B.V.Sc., Toronto.

The Association convened for the first time during the celebration of the 50th anniversary of the College, when further steps towards perfecting the organization were taken and the following constitution and By-laws adopted.

CONSTITUTION OF THE ALUMNI ASSOCIATION.

ARTICLE I.—NAME.

This Association shall be known as THE ALUMNI ASSOCIATION OF THE ONTARIO VETERINARY COLLEGE. It shall consist of active and honorary members.

ARTICLE II.—OBJECT.

The objects of this Association are to promote good fellowship; to elevate the standards of veterinary education; to cultivate veterinary science and literature; to enlighten and direct public opinion regarding veterinary problems; to protect the material interests of the veterinary profession.

ARTICLE III.—OFFICERS.

Section 1.—The officers of this Association shall be a President, two Vice-Presidents, and a Secretary-Treasurer. These officers shall be elected by ballot at each triennial meeting, and a majority of all votes cast shall be necessary to a choice. The term of said officers shall be until their successors are chosen. They shall without delay transfer to their successors all property belonging to the Association.

Section 2.—The elective officers, together with six members to be appointed triennially by the President, shall constitute the Executive Committee. One of the members shall be designated by the President as chairman of said committee.

Section 3.—The duties of officers, requisites of membership, times of meetings of this Association, and such regulations as may be necessary for the government of the same, shall be provided for in the By-laws.

BY-LAWS.

ARTICLE I.—PRESIDENT.

Section 1.—It shall be the duty of the President to preside at all meetings of the Association, to preserve order and decorum, and to present an address at the triennial meeting following his election.

Section 2.—The President shall have power to order payment of bills that may be presented to the Secretary-Treasurer during the year, if in the judgment of the President and Secretary-Treasurer said bills are true and correct, and the President deems it wise to make immediate payment.

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Section 3.—He shall appoint all committees unless otherwise ordered by the Association, and shall perform all the duties prescribed by the by-laws and resolutions of the Association.

Section 4.—He shall annually appoint Resident State and Provincial Secretaries, who shall perform such duties as are herein assigned to them.

ARTICLE II.—SECRETARY-TREASURER.

Section 1.—The Secretary-Treasurer shall keep the records of the proceedings of the Association. He shall receive all applications for membership, fees and dues. He shall give security for the trust reposed in him whenever the Association may deem it requisite. He shall keep on file all official documents relating to the Association that may come into his care.

Section 2.—It shall be the duty of the Secretary-Treasurer to notify each candidate of the receipt of his application for membership and transmit to him a copy of the Constitution and By-laws. It shall also be the duty of the Secretary-Treasurer to notify all elected to membership.

Section 3.—He shall notify in writing the chairman and other members of all committees of their appointment by the President or by the Association, giving the name, duties and membership of the committee; he shall also notify each Resident State and Provincial Secretary of his appointment, and shall perform such other duties as may be assigned to him.

Section 4.—He shall publish in each report of the proceedings of the triennial meeting of the Association a list of the officers, standing committees, and active and honorary members, with their addresses.

Section 5.—The Secretary-Treasurer shall receive and have charge of the funds of the Association, and shall give security for the trust reposed in him whenever the Association may deem it requisite.

Section 6.—It shall be the duty of the Secretary-Treasurer to put all the moneys of the Association into one fund, to be appropriated for the payment of current expenses and for such other uses as the Association may direct.

Section 7.—He shall pay all bills which come into his hands duly approved by the President.

Section 8.—At each triennial meeting he shall give a detailed statement of all his official receipts and disbursements, which statement must be duly audited and signed by the Finance Committee.

ARTICLE III.—EXECUTIVE COMMITTEE.

Section 1.—The President may call a special meeting of the Executive Committee whenever he shall deem it necessary. The Executive is empowered to transact business by correspondence.

Section 2.—A majority of the committee shall constitute a quorum for the transaction of business. Any vacancy due to the absence of an appointed member shall be temporarily filled by the President, acting Vice-President, or, in their absence, by the chairman of the committee.

Section 3.—The records of the proceedings of the Executive Committee shall be kept by the Secretary-Treasurer.

Section 4.—The Executive Committee shall be invested with power to hear and determine upon complaints filed before it in writing relative to the improper conduct of any member of the Association, and the committee shall, if thought advisable, summon the member so charged to appear before it at the next meeting of the Association, to answer the charges and make defence. If the committee finds the defendant guilty of all or part of the offence as charged, said Executive Committee shall report to the Association a summary of the charges and evidence submitted on both sides, together with such recommendations as may by said committee be deemed wise; but

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no public report of such charges or evidence shall be made by the Executive Committee or by any member thereof.

Section 5.—The place of meeting shall be the City of Toronto, unless otherwise designated.

ARTICLE IV.—COMMITTEES.

Section 1.—The regular committees of the Association, in addition to the Executive Committee, shall be as follows, and the members of the same shall be appointed by the President at each triennial meeting or as soon thereafter as may be practicable.

Committee on Progress and Education—Five members.
Committee on Diseases—Five members.
Committee on Legislation—Five members.
Finance Committee—Three members.
Committee on Local Arrangements—Number of members at option of the President.
Committee on Necrology—Three members.

Section 2.—The duties of the above committees shall be as their titles indicate.

BRIEF SYNOPSIS OF METHODS ADOPTED IN TEACHING VARIOUS BRANCHES OF VETERINARY SCIENCE IN THIS COLLEGE.

Contagious Diseases of Animals.—Is taught by lectures illustrated with diagrams, diseased tissues, and when possible, with infected animals.

Veterinary Hygiene.—Taught by lectures, illustrated with materials used in promoting health; and observations in the Veterinary Infirmary of the College.

Sporadic Diseases of Animals.—Embracing the various diseases which are not regarded as contagious. Their causes, symptoms and treatment will be thoroughly described in lectures, illustrated with numerous specimens now in the Museum of the College, also with affected animals as they occur from time to time in the practice of the Infirmary.

Veterinary Anatomy.—Is taught first by descriptive lectures in the Class Room, and the applied science by a full course of dissection in the commodious dissecting room near the main building of the College.

Veterinary Surgery.—Is taught first in the Class Room by illustrated lectures, and the applied science or practical work of the course is freely demonstrated in an amphitheatre fitted for the purpose.

Physiology.—Includes a course of about 60 lectures on the physiology of domestic animals, in which the following subjects are discussed, viz.: The blood and phenomena of clotting; the circulatory mechanism of the heart and blood vessels; Physiology of digestion and absorption of foods; chemical characters of different foods; digestive secretions; digestions in different parts of the alimentary tract; respiration and mechanism of the organs concerned; the physiology of ductless glands; neuro-muscular mechanism; the central nervous system: the production of heat in the body and the regulation of body temperature; the central nervous system and functions of the chief parts of the brain; the physiology of the special senses; the physiology of the kidney and the other excretory organs.

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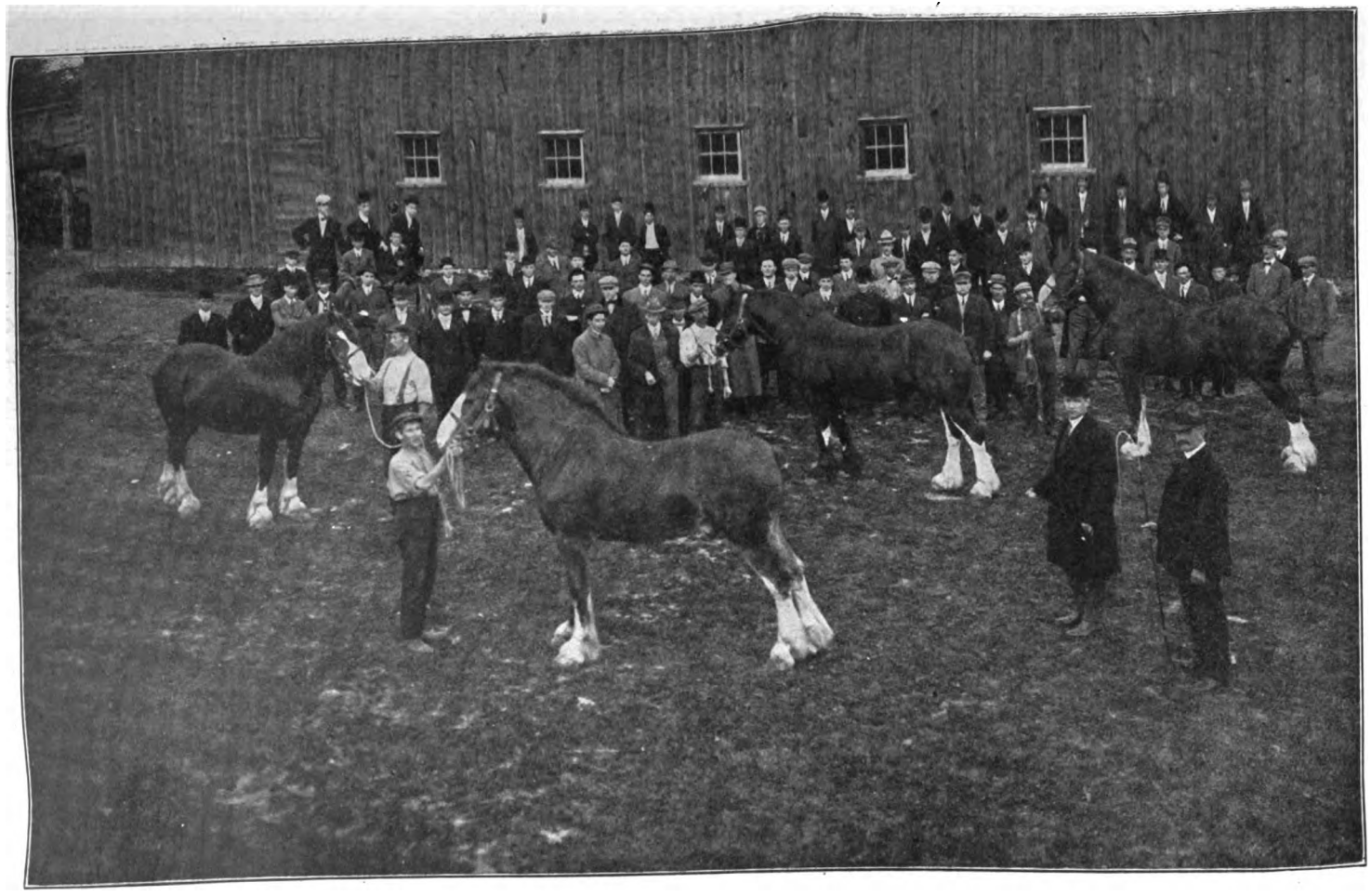

Ontario Veterinary College students studying best types of animals on nearby farms.

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Veterinary Materia Medica.—Embraces a description of the most important drugs and agents used in the cure of disease and the alleviation of pain, including their actions, uses, and doses for the various domestic animals. The practical teaching of this branch of the course is conducted in a suitable Pharmacy, as well as in the stalls of the infirmary. The lectures for the first year are largely directed to the actions and uses of medicines.

Veterinary Pathology.—The course in this subject extends over two years and includes a series of lectures and laboratory demonstrations, both macroscopic and miscroscopic. The lectures are divided so that general pathology is taken up the first year, and the following year is devoted to special pathology. Gangrene; degeneration; infiltrations; inflammation; tumors; cysts; hypertrophy; atrophy and bone diseases, are some of the subjects which will be discussed.

Veterinary Histology.—Is taught by illustrated Class Room lectures, all of which will be demonstrated in a spacious room for the purpose, and the student will be required to prepare, mount, stain and examine with the aid of a microscope various tissues in health, including the blood of various domestic animals.

Veterinary Obstetrics.—Is taught by a full course of lectures, illustrated with large diagrams and numerous instruments used in the practice of this most important art.

Post Mortem Demonstrations.—Is conducted by descriptive lectures and autopsies, on subjects procured for the purpose, in the amphitheatre of the College.

Bacteriology.—This branch of the College course receives full consideration numerous lectures in which special attention is given to technique in preparing and studying certain micro-organisms or germs, especially those which are believed to cause disease. The study of toxins, and the preparation of anti-toxins, vaccines and other biological products is extensively discussed and demonstrated. An extended laboratory course is given in this subject.

Chemistry.—Is taught by lectures and a course of laboratory instruction.

Zoology.—Is taught by illustrated Class Room lectures, and by laboratory methods. Much time is spent in the study of the Protozoa and the like.

Botany.—Is taught by lectures in the Class Room. The applied science is taught by laboratory methods and from specimens procured in the field.

Parasitology.—Is taught in the Class Room and the practical feature of the subject is illustrated by specimens, drawings and dissections made by the student in a laboratory equipped for that purpose.

Veterinary Dentistry.—This branch of our course is fully discussed in illustrated lectures in the Class Room, and the practical education of the student in the art is fully demonstrated in the amphitheatre.

Breeds and Breeding of Domestic Animals.—Is taught by lectures illustrated by diagrams in the Class Room, and living animals at famous Stock Yards in the vicinity of Toronto.

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A small section of the 2nd year class in attendance at a surgical clinic.

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Meat Inspection.—Is fully taught both in the Class Room of the College, and at Abattoirs, in a manner which will be in accord with the laws and regulations of Veterinary Sanitary Science throughout the Dominion.

Horse-Shoeing.—Is fully discussed in the Class Room and practical illustrations of the art are conducted in the amphitheatre of the College.

Veterinary Jurisprudence.—Consists of a course of lectures, including a number of subjects which are important to the Veterinary Surgeon, such as contracts relating to the purchase and sale of live stock, unsoundness and vice in horses or other animals, the straying and impounding of cattle, laws relating to transportation of live stock, laws relating to the spread of malignant diseases, laws relating to diseased meats, laws of the road, the law of warranty and kindred subjects.

Dairy Inspection.—Includes lectures in the construction of the dairy barn and milk house; the care of utensils; the handling of milk from the time it is drawn from the cow until it is placed upon the market for sale. Dairy cattle in health and disease, especially those which are communicable to the human family through milk, and various other matters relating to dairy inspection.

Pharmacy.—The instruction given in this course is largely of a practical nature and students are directed in the work by an experienced teacher how to prepare as well as to care for numerous articles or drugs used in the cure of disease. Introductory lectures are also given in this course.

Embryology.—Is taught by a course of lectures in the class room and also a laboratory course including the practical study of prepared sections of Embryos of different ages.

Milk Inspection.—This course consists of twelve lectures. Normal milk is fully considered in the first two lectures. The remaining lectures are taken up with a description of methods of adulteration, tests for butter fat, description of various products of milk. Wherever possible the tests for adulterants, etc., are carried out before the class.

The Calendar of the College contains full instructions for students entering, copies of examination papers, and class lists.

The new college building is nearing completion, and will be ready for the next Session of the College.

I have the honour to be,

Sir,

Your obedient servant,

E. A. A. GRANGE,
Principal.

31st October, 1913.

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AN ACT RESPECTING THE ONTARIO VETERINARY COLLEGE.

Chap. 282, R.S.O. 1914.

HIS MAJESTY, by and with the advice and consent of the Legislative Assembly of the Province of Ontario, enacts as follows:

1. This Act may be cited as "The Veterinary College Act."

2. The Ontario Veterinary College heretofore established in the City of Toronto and conducted by the Ontario Veterinary College, Limited, and to which certain powers were given by the former Agricultural and Arts Association, is continued as The Ontario Veterinary College, under the direction of the Minister of Agriculture.

3. The College shall be furnished with all such appliances and equipment as may be necessary for theoretical and practical training in the science and art of veterinary medicine, and in such other branches of education as may be requisite for the intelligent and successful performance of the business of a veterinary surgeon.

4. The Lieutenant-Governor in Council may appoint a Principal and such professors, lecturers and instructors as may be deemed necessary for giving instruction in the College and the promotion of its usefulness, and may pass by-laws regulating and prescribing their respective duties.

5. The Lieutenant-Governor in Council may authorize the making of arrangements whereby instruction in any of the subjects prescribed to be taught in the College may be provided by the University of Toronto or by the Ontario Agricultural College, or by any other College affiliated with the University of Toronto.

6. The government of the College shall be under and according to such rules and regulations as the Lieutenant-Governor in Council may from time to time prescribe, and such rules and regulations shall contain provisions for the standard and mode of admission; the course of study; the fees to be charged; the sessions, terms, and vacations; and such provisions as may be deemed expedient touching the conduct of students.

7. Every student upon the successful completion of the course of study, upon passing the prescribed examination, and upon satisfactory compliance with the rules and regulations of the College, shall be admitted to the standing of a Veterinary Surgeon and shall have all the privileges and rights accorded by statute to a Veterinary Surgeon, and there shall be issued to every such student a diploma granting him the title, degree and standing of Veterinary Surgeon, and such diploma to be attested by the signatures of the Principal of the College and the Minister of Agriculture.

8. The Lieutenant-Governor in Council may by order make provisions whereby in case of the loss or destruction of any diploma issued by the former Agriculture and Arts Association, the former Ontario Veterinary College, Limited, or by the Minister of Agriculture, a duplicate diploma may be issued to the person entitled to the same.

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9. The Lieutenant-Governor in Council on behalf of the Province may accept, hold and enjoy any gifts, bequests or devises of personal or real property or effects which any person or any government may think fit to make for the purpose of the said College.

10. The Lieutenant-Governor in Council may, if deemed advisable, appoint an Advisory Board to advise and assist the Minister of Agriculture in the management of the College, and may by Order-in-Council prescribe its duties and powers and the amounts to be allowed for the services and expenses of the members of such Board.

11. The College is affiliated with the University of Toronto to the extent of enabling the students of the said College to obtain at the examinations of the University such rewards, honors, standing, scholarships, diplomas, and degrees in Veterinary Science as the University has authority to confer.

12. The Principal of the College shall at the close of each year present to the Minister of Agriculture a report upon the work of the College in such form as the Minister may approve, setting forth the staff, the course of instruction, the students in attendance, the examination results, the income and expenditure, and such general information as shall show the work being done, and this report shall be laid before the Legislative Assembly within the first thirty days of the session next ensuing.

13. The Lieutenant-Governor in Council may purchase or acquire or lease such buildings and premises as may from time to time be required for carrying on the work of the College.

14.—(1) The lease of the buildings and premises used by the said College from one Andrew Smith to the Minister of Agriculture, as representing His Majesty the King, and bearing date the twenty-eighth day of July, one thousand nine hundred and eight, is hereby approved.

15. No person or persons, association, company or organization other than is authorized under this Act shall, by advertisement or otherwise, use the name of the Ontario Veterinary College, and no person or persons, association, company or organization shall, by advertisement or otherwise, use any name similar or analogous to that of the Ontario Veterinary College, without first receiving the consent of the Minister of Agriculture in writing.

(2) Any person violating the provisions of this section shall incur a penalty not exceeding $50, and in default of payment thereof shall be liable to imprisonment for not less than thirty days.

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AN ACT RESPECTING VETERINARY SURGEONS.

Chap. 171, R.S.O. 1914.

HIS MAJESTY, by and with the advice and consent of the Legislative Assembly of the Province of Ontario, enacts as follows:—

1. This Act may be cited as *The Veterinary Surgeons' Act.*

2. Any veterinary practitioner holding the diploma of the Agriculture and Arts Association or that of the Ontario Veterinary College or any other diploma or certificate declared by the Lieutenant-Governor in Council to entitle the holder thereof to use the title Veterinary Surgeon, shall be entitled to professional fees in attending any Court as a witness in such cases as relate to the profession.

3. Any person not possessing a diploma or proper certificate from The Ontario Veterinary College or a diploma or certificate of a college whose diplomas or certificates are declared by the Lieutenant-Governor in Council to entitle the holders thereof to use the title of Veterinary Surgeon who appends to his name the term Veterinary Surgeon, or any abbreviation thereof, and any person who wilfully and falsely pretends to be, or who wilfully and falsely takes or uses any name, title, addition, abbreviation or description implying or calculated to lead people to infer that he is, or is recognized by law as a Veterinary Surgeon, within the meaning of this Act, or that he possesses a diploma or certificate from any such college, shall incur a penalty not exceeding $100, and not less than $25, recoverable under *The Ontario Summary Convictions Act.*

4.—(1) A graduate of a Veterinary College recognized by the Lieutenant-Governor in Council may practise in the Province of Ontario upon passing all the examinations of the senior class of the Ontario Veterinary College at the time and place of the annual examinations of the aforesaid Ontario Veterinary College.

(2) The applicant for such examination shall pay a fee of $25, and shall produce a veterinary preceptor's testimonial certifying that he has practised veterinary surgery under said preceptor for at least six months, or in lieu of said testimonial a statutory declaration certifying that the applicant has practised veterinary surgery for at least one year after graduating from such recognized Veterinary College.

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Thirty-Fifth Annual Report

OF THE

Ontario Agricultural and Experimental Union

1913

(PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE, TORONTO)

PRINTED BY ORDER OF
THE LEGISLATIVE ASSEMBLY OF ONTARIO

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1914

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TORONTO

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To His Honour SIR JOHN MORISON GIBSON, Knight Commander of the Most Distinguished Order of St. Michael and St. George, a Colonel in the Militia of Canada, etc., etc., etc.

Lieutenant-Governor of the Province of Ontario.

MAY IT PLEASE YOUR HONOUR:

I have the pleasure to present herewith for the consideration of your Honour the Report of the Agricultural and Experimental Union for 1913.

Respectfully submitted,

JAMES S. DUFF,

Minister of Agriculture.

Toronto, 1914.

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Ontario Agricultural and Experimental Union

OFFICERS FOR 1914

President ..... T. H. MASON, Department of Agriculture, Ottawa.
Vice-President ..... HERBERT GROH, Preston, Ont.
Secretary and Editor ..... C. A. ZAVITZ, Agricultural College, Guelph.
Assistant Secretary ..... W. J. SQUIRRELL, Agricultural College, Guelph.
Treasurer ..... H. L. HUTT, Agricultural College, Guelph.
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Auditors ..... A. W. MASON and R. R. GRAHAM.

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Poultry Raising ..... W. R. GRAHAM (Director), R. M. TIPPER, and J. E. SMITH.
Bee-Keeping ..... MORLEY PETTIT (Director), GEO. F. KINGSMILL, and W. B. ANGLE.
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Schools' Division ..... S. B. MCCREADY (Director), H. L. HUTT, J. W. CROW, A. H. MCLENNAN, WM. HUNT, C. A. ZAVITZ, W. R. GRAHAM, S. F. EDWARDS, E. J. ZAVITZ, R. HARCOURT, and J. A. MCDONALD.

COMMITTEE ON THE PREVENTION OF THE IMPORTATION AND THE DISTRIBUTION OF NOXIOUS WEED SEEDS IN GRAINS AND IN SCREENINGS.

G. H. CLARK (Chairman), R. HARCOURT, J. R. DYMOND, G. E. DAY, and J. E. HOWITT.

COMMITTEE APPOINTED TO MAKE A STUDY OF THE PRESENT WEED ACTS OF THE DIFFERENT PROVINCES OF CANADA, AND IF THOUGHT ADVISABLE TO MAKE SUGGESTIONS AS TO HOW THE ERADICATION OF WEEDS IN ONTARIO COULD BE MADE MORE EFFECTUAL.

J. E. HOWITT (Chairman), HON. NELSON MONTEITH, and W. J. LENNOX.

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TREASURER'S REPORT, 1913.

Receipts.		Expenditures.	
Balance from last year	$1,203 63	Agricultural experiments	$1,702 16
Membership fees, 349 at 50c.	174 50	Schools' extension work	893 03
Government grant	2,750 00	Fertilizer experiments	164 74
		Apicultural experiments	490 34
		Botanical investigations	35 50
		Part expenses of annual meeting, 1913	62 00
		Advertising meeting, 1914	197 00
		Meeting of Executive	6 55
		Total	$3,551 32
		Balance on hand	576 81
Total	$4,128 13		$4,128 13

We, the undersigned auditors, declare that we have audited the Treasurer's accounts and found them correct.

R. R. Graham,
A. W. Mason,
Auditors.

January 10th, 1914.

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Ontario Agricultural and Experimental Union

ANNUAL MEETING.

The thirty-fifth annual meeting of the Ontario Agricultural and Experimental Union was held at the Ontario Agricultural College, Guelph, on Monday, Tuesday, and Wednesday, January 12th, 13th and 14th, 1914. There were in all six sessions. The first session was held on Monday evening, and was in connection with the official opening of the new building for the Department of Field Husbandry, at which occasion the Hon. James Duff, Minister of Agriculture for Ontario, acted as Chairman. Addresses were delivered by the Hon. Martin Burrell, Minister of Agriculture for the Dominion; Dr. G. C. Creelman, President of the Ontario Agricultural College; Mr. W. Bert Roadhouse, Deputy Minister of Agriculture for Ontario; Mr. Westbrook, President of the new University of British Columbia; and Mr. H. C. Scholfield, M.L.A., Guelph. The reports and addresses which were presented, and the most important discussions which took place during the different sessions of the Experimental Meeting, are embodied in this report.

SECRETARY'S REPORT.

C. A. ZAVITZ, PROFESSOR OF FIELD HUSBANDRY, O.A.C., GUELPH.

Thirty-five years of the life history of the Ontario Agricultural and Experimental Union are brought to a close with this annual meeting. The co-operative experimental feature of the work, which was started in a small way at the beginning of the organization, has been developed in method and in extent from year to year until it has become very extensive and far-reaching in its results. In 1913 the co-operative work of the Experimental Union was conducted on farms throughout Ontario in agriculture, agricultural chemistry, agricultural botany, forestry and apiculture, and in connection with the public schools in elementary agriculture, horticulture, and forestry. The co-operative work in field husbandry has been conducted under the present system for twenty-eight years, during which time there have been 72,495 distinct tests made throughout the Province. The increase in the number of experimenters in agriculture can be seen from the following figures, which show the average yearly number actually engaged in the work in each of the seven four-year periods covering the twenty-eight years during which this work has been in progress:

Four-year Periods.	Average Number of Experimenters per Annum.
1886-1889	73
1890-1893	557
1894-1897	2,058
1898-1901	3,157
1902-1905	3,533
1906-1909	4,231
1910-1913	4,538

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It will be seen that the growth has been of a very substantial character. We have strong evidence for the belief that this system of co-operative work has a very wholesome influence throughout the province of Ontario. It is extensive in its operation, far-reaching in its results, and is doing the work which could not possibly be accomplished in any other way.

During the past year there has not been any necessity for having more than three meetings of the Board of Control of the Experimental Union. Two of these were held in January and one in September.

The Annual Report of the Experimental Union was published by the Ontario Department of Agriculture in the latter part of 1913 and about 30,000 copies were distributed. We are pleased to state that in recent years practically all of the leading provincial papers have had representatives at our annual meetings. This has given a large publicity to some of the important features and results of the co-operative experiments as conducted throughout the Province.

We wish to take this opportunity to thank the thousands of farmers throughout Ontario who have so willingly and so earnestly assisted in carrying forward the co-operative experimental work during the past year. While it is true that these experiments have been decidedly advantageous to the men who conducted them, at the same time the results have had a wide application and have furnished some most valuable information to the farming community as a whole. Besides the associates and the graduates of the College who are now farming in Ontario a large number of leading and influential farmers of the Province who have never had the opportunity of attending an agricultural college are doing most commendable work. The experimenters who have conducted experimental work successfully on their own farms in each of six or eight years, and are therefore specially trained for even better work in the future, are numbered by the hundreds. Their work in particular is of inestimable value to the Province.

The Ontario Agricultural and Experimental Union has a peculiar field of its own. It is an organization of active workers. These men are doing things that count for much. They are furnishing material which forms the basis of talks and discussions at Farmers' Institutes and at Farmers' Clubs. Each experiment forms a centre of interest and of inspiration. Failures in the co-operative work as well as successes may have their lessons. The experimenters who are active farmers endeavour to interpret the results of their various experiments. The very act of experimenting, the interesting observations made during the growing season, the preparation of the records and the endeavour to understand the real meaning of the results are all conducive to a more thoughtful and wholesome consideration, not only of the experiments themselves but also of the various other operations of the farm. It is probably safe to say that the successful development of a system of co-operative work rests not only with those actively engaged in carrying forward the work, but also upon the intelligence and the progress of the people as a whole. The fact that Ontario has been so successful with its system of co-operative experiments in agriculture indicates more than words can express the intelligence and the ability of the farmers of this Province.

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PRESIDENT'S ADDRESS.

LEWIS TOOLE, MOUNT ALBERT.

We welcome you here this morning and are glad to see so many present. The attendance to-day is very different to what it was thirty-five years ago. To the young members of the Experimental Union I want to say that we who have been associated with the work of the Experimental Union for the past thirty-five years now feel like laying this burden down, and only hope that you will be as willing as you are able to take up this work, and carry it on to an even greater success than has been in the past. We hope you will be faithful and diligent in doing that work which we know has a great future before it, a future which will be a benefit to those actively engaged in the work, as well as to the country as a whole. When we begin our programme I would suggest that all those present throw off that restraint which we ordinarily have at these gatherings. Be prepared to enter into the discussions, for only in this way can the most good be obtained.

Thinking makes us observe, and as we observe we naturally become men of action rather than men of words. We expect that the Ontario Agricultural College will always have a cutting edge so that she will be able to wrest from nature her secrets. Nature is providing us all the time with new secrets, and we must be practical enough to put them into operation.

In 1879, when the Experimental Union was first organized. the members at that time were inspired with the work that this Union might achieve. It was then decided to have each year an annual meeting to discuss the results of experiments and various other agricultural topics. I had the honor of naming this organization, and also explained to the students present at our first meeting the objects and aims of the society. At that time we planted a tree on the banks of a nearby stream to symbolize the steady flow of students through the college supplying life and vigor to the country. At this first meeting we appointed a committee to draw up a constitution, and that constitution is practically the same to-day as it was thirty-five years ago. Officers were elected, and the members each contributed fifty cents to provide funds. Three cheers were then given for the Ontario Agricultural College and the Experimental Union, and the meeting adjourned. Of the many forces that have gone to make this Union a success, the bond of friendship existing between individual members is, in my estimation, the most important. Friendship is one of the most important things that we get out of life. By living up to the traditions of the past we will not only make this Province great with the young men issuing from college, but we will strengthen those outside. If we follow out the ideas of this Union depend upon it patriotism and Canadianism will bind us together, and we will produce a population of intelligent men and women, so far as agriculture is concerned, and so far as the agricultural atmosphere can influence the outside world.

I would like to give you here a short history of the commencement of the co-operative experiments. In the election held in 1885 some of the candidates elected were more or less unpopular, and some of the students refused to experiment. However, this difficulty was overcome, and practical farmers at that time became experimenters as well as Union members. We must have men to carry out these experiments, and we certainly expect that the men of this Union will lead in this work. We want, of course, the farmers of Ontario, all of them, to be experi-

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menters. While we welcome to our meetings every farmer who is able to come, and while we give each individual farmer the same chance to experiment as the active members of the Union, still we expect from those who have received a training at this institution more than the average farmer is able to do.

I have just two further suggestions to make. In the thirty years that have passed, the farmers of Ontario in their agricultural operations have been following a cycle or rotation of crops with the idea of growing those crops which will extract the fertility from the very depths of the soil. I want to emphasize the importance of clover as one of the very best crops for enriching the soil. If we can produce clover almost continuously on our farms it will be worth millions of dollars to the Province of Ontario. Failure to produce a crop of clover causes our soil to decrease in fertility so that we cannot produce the same variety of other crops. The two principal causes of failure in growing clover is dry weather during the months of May and June, and winter killing. Both of these may be overcome by selecting the best plants year after year, and by this means getting a strain strong enough to resist these conditions. I have some clover seed here that I am going to present to Professor Zavitz. It has lived through three very hard winters. This clover seed comes from a stand that we had on a ten acre patch. It was a beautiful catch, but met with a hard winter, and became pretty well killed out. I left some of the plants standing, and got two bushels of seed off the ten acres. I continued to grow that seed, and it stood the following winters without being killed out. I want Professor Zavitz to put it in the experimental plots against the hardiest types of clover that he is growing. We get many good things from Guelph, and when we have a chance to return something which we think is of value it behooves us to do it. Selection is most important. If we can increase the value of our present crops by this means from one-eighth to one-quarter in comparative yield this will mean millions of dollars of annual revenue to the Province.

Just a word in regard to clean grain. For thirty years I have cleaned my grain as thoroughly as I could. I find that cleaning alone makes a vast difference in the returns. I want to put my suggestion in such a shape that every farmer can do as I have done. Place the riddles in the fanning mill, then put in the screens and leave them there, and run the grain through, taking out all the dirt. This will perhaps necessitate putting the grain through two or three times. After this take one-half or all of the riddles out, leaving the screens in. Put on all the wind you can, running your mill to the limit. This will blow perhaps one half of the grain out. If you then pick out the very best of what is left you will have a sample of grain that is worth sowing. I have found by doing this that the grain produced is of a stronger texture, better color, and gives a better yield per acre. What I had blown over and not used for seed I fed to the stock.

I want to once more invite you all to enter as heartily as you can into the various discussions. There is not a man in this room but has some idea in his mind that might be of benefit to his neighbour.

Hon. Nelson Monteith: It has been detailed to me to make a few remarks in opening the discussion on the President's address. I hope that I shall be followed by a good lively discussion by the other members; they have all had an equal opportunity of analyzing his remarks. It does seem as if we were singularly favored this year to have in our presence the man who first conceived the idea of the organization of this institution, known as the Experimental Union of Ontario, and who had from the first an almost prophetic insight into the future;

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thinking as he did then that this would be the great clearing-house of expert agricultural knowledge; that the findings of this Ontario Experimental Union would be the standard for our agricultural Province. It has been so, and I believe it will continue to be the same to the great rank and file of the farmers throughout this Province, who are to-day looking forward to the findings of this Agricultural Union. And it should be so, because the men who are conducting this work—it might well be termed a privilege—have had their training here largely; they are men who have had experience and they have acquired a fine fund of knowledge along agricultural lines. It requires knowledge of how to conduct these experiments that the findings may have value in our agricultural work. Now I do not know that I need extend my remarks further than to say that from the discussions we get the inculcation of ideas, and from them knowledge will come. I wish to draw your attention to a few things that have been helpful in the work of this institution, one being the continuous enthusiasm that has animated the members from the very beginning. While I can claim a certain amount of veneration, I suppose I might call it, in connection with this work, I am as yet one of the infants in the work as well. It is now some twenty-eight years since I first became associated with the work of this Union, and during all these years there has been a continuous enthusiasm animating all the members from the very beginning. Then, too, we owe a deep debt of gratitude to men like Professor Zavitz, who has been so indefatigably engaged. Professor Zavitz is the one man to whom we have always looked; he is the magnet that brings us back from year to year. This college has set the example of close application to the work of this Union; not only that, but friendship and fellowship have been instilled from the very same college, and this I trust will continue as the student body expands and goes out to the farmers of Ontario, wherever their lot will be cast, whether in the professional line, or in the quiet of the home life on the farm. Some doubt the advisability—I see the press has touched on the matter—of the students of this institution as a body engaging so largely in professional work as teachers and instructors throughout the length and breadth of this Province. Now, I believe, possibly there has been a little tendency to belittle the line of work that has been going on, but it is a wholesome sign of the times too, because it shows that our students are reaching out right into the heart of the Province, and reaching the hearts of the people, rousing them to take advantage of the opportunities thus afforded. In this, I think, Guelph is doing a legitimate and wholesome work. Whilst I have myself personally sought the quiet of the farm, and have done some work there which I hope may be of help to the community in which I live, I believe it is not well that we should all go back to the farm and engage in that strenuous occupation; I believe it is well for some to take to other fields and thereby increase the knowledge which this institution gives, by touching the great masses of the people. The farmers of this country throughout the length and breadth of the land are looking to this institution as they never looked before; they are in sympathetic touch with this institution as they never were before, but I tell you, gentlemen, the whole profession is being raised by the accumulation of greater knowledge along agricultural lines and the prospects for the future. None of the concession lines have been touched. Much has been done, but it is to the students of to-day that we are looking; the men who are here to-day; and to the men who will come after you to build on what has already been done by those who have gone before. We are looking to you to go out into the side lines—the highways and byways—to preach the gospel of glad tidings of agriculture; to infuse with your enthusiasm those farmers who are

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dwelling in these back districts; to bring this knowledge to the quiet of his own country home; that he will appreciate his surroundings, and in the years to come the better conditions under which he lives. I thank you, gentlemen, for this opportunity of speaking to you, and hope the discussion may prove profitable to all. I feel how great are our possibilities. Our first duty at a meeting of this kind is to try and enthuse ourselves with the possibilities of the occupation in which we are engaged.

PROFESSOR C. A. ZAVITZ: It did my heart good when Lewis Toole gave his address in connection with the early history of this Experimental Union. We welcome him back; and we hope that he will be with us for many years, and that he will always feel at home. The students of the present time give him a hearty welcome back to his old Alma Mater. (Applause.) Lewis Toole sowed the seed thirty-five years ago, the harvest of which is being reaped all over the Province of Ontario by thousands of farmers, and we are very grateful to him. He has brought to-day the little bunch of clover seed and presented it to me; I hope I may accomplish much with that. We do not know yet what influence that clover seed will have in the Province of Ontario, but it may be that "Toole's Red Clover" seed will become the noted Red Clover seed of the Province of Ontario. I think Mr. Toole has done something in this worthy of example. Mr. Toole had a ten acre field of this clover badly killed, but some plants came through which proved to be more hardy than the others, and the seed of these hardy plants he replanted. He is in a position to do this better than we can do it. We, of course, have fields of Red Clover, and are watching to get the best out of them. We do not know when we experiment what may be the outcome. I admire Lewis Toole for the start he made thirty-five years ago with this Union, and for coming back to us at this time with his clover seed.

RESULTS OF CO-OPERATIVE EXPERIMENTS IN AGRICULTURE.

C. A. ZAVITZ, PROFESSOR OF FIELD HUSBANDRY, O.A.C., GUELPH.

The Committee on co-operative experiments in agriculture has been active during the past year. As Director of this branch of the work, I am pleased to report the results of the successful experiments which have been carefully conducted throughout the Province in 1913. I wish to express my appreciation of the substantial help furnished by the other members of the committee, viz., A. W. Mason, W. J. Squirrell, A. E. Whiteside and C. R. Klinck. It is probably safe to say that not many people realize the great amount of labor which is necessary in successfully conducting co-operative experimental work as extensively as is being carried on in Ontario. This work reaches not only the various counties, but practically all of the townships, and presumably the majority of the school sections of Ontario. The co-operative experimental work is very broad in its scope, and includes as its active workers people varying largely in age, education, wealth, location and influence.

In 1913 there were in all thirty-eight distinct experiments in agriculture including spring and fall grains, root crops, forage, fodder, silage and hay crops, culinary crops, the growing of grains and fodder, crops in different combinations, different quantities of grain per acre, and the application of commercial fertilizers

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and farmyard manures with winter wheat, mangels, barley and potatoes. Most of the plots were one rod wide by two rods long, being exactly one-eightieth of an acre in size. This size of plot answers admirably as the experimenters can usually secure land for plots of this size which is quite uniform, and owing to the size of the plots they are able to weigh the products without very much difficulty. At one time we had plots which were as large as one-half acre in size, but those proved to be very cumbersome, and the results were quite unsatisfactory, but with the smaller size plots the experiments can be kept more thoroughly under control, and more reliable and definite results can be obtained.

There was considerably less rainfall throughout Ontario in 1913 than in the year previous. At the Agricultural College, Guelph, the autumn of 1912 was comparatively wet, the winter was rather mild, the spring was fairly early, and the summer was about normal in regard to both temperature and rainfall. These general remarks will probably apply fairly well to the Province except in the Eastern portion, and in some of the Northern sections where the amount of rainfall in June and July was comparatively light. The season, however, has had its peculiarities, and the individual experimenters have had an opportunity of studying the results of experiments under their own particular conditions of rainfall and temperature. On the whole I think we are safe in saying that we have had a good year in connection with our co-operative experimental work in agriculture.

The results of experiments and investigations obtained at the Ontario Agricultural College form the basis of both the methods of operation, and the material selected for the co-operative work which is being carried on throughout Ontario. Close attention has been given to the methods used for these co-operative experiments, and printed instructions for conducting the tests, along with blank forms on which to report the results, have been forwarded to every person undertaking the work. From the beginning the co-operative experimental work of the Union has been directed and controlled by circulars and letters, printed and written, which have been transmitted through the mails. Personal letters have frequently been sent to give encouragement and advice. The members of the committee have not taken the responsibility of overseeing or controlling the experiments, but if special visits have been made to the experimenters the object has been to enable the directors to study the difficulties of those actually engaged in the work, and thus be in a better position to know the best methods to adopt in the printed instructions. This method places the experimenters upon their honor and tends to bring out the best that is in them. Every man is made responsible for his own experiments, and is urged to do the very best he can for himself, for his neighbors, and for agriculture as a whole. An interesting feature in connection with this work is the fact that, frequently, persons who at first took but little interest in the experiments, have afterwards proven themselves to be most valuable experimenters, and have shown great care and accuracy in the details of their work. Great care is exercised in planning the various co-operative experiments in such a way that they can be successfully undertaken by the people who are to be benefited thereby. Some experiments are comparatively simple, and consist of only two plots in each test, while some of the others are much more complicated, and consist of ten plots. In every case, however, the work is made as clear of comprehension, as definite of purpose, and as simple in method of operation as is consistent with the objects in view. It has been the constant aim to make all experiments as interesting and as instructive as possible.

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The Experimental Union forms an excellent avenue through which some of the very best material produced through the work at Guelph may be brought to the homes of the farmers. Some of the crops which are now grown most extensively in general cultivation throughout the Province received their start through the medium of the Experimental Union. The Mandscheuri Barley, the Siberian Oats, the Daubeney Oats, the Dawson's Golden Chaff Winter Wheat, the Early Britain and the Canadian Beauty Peas, the White Cap Yellow Dent, and the Wisconsin No. 7 varieties of corn, the Ontario Variegated and the Grimm varieties of alfalfa, and many other varieties that are now very prominent in Ontario have been distributed to the Union experimenters throughout the Province in past years. More recently some of our own varieties such as the O.A.C. No. 21 Barley, the O.A.C. No. 72 Oats, the O.A.C. No. 3 Oats, and the O.A.C. No. 61 Spring Rye have been distributed to experimenters, and are being increased very rapidly, and with most excellent success in various localities throughout the Province, in fact it is probably safe to say that 95 per cent. of all the barley that is now grown in the Province consists of the Mandscheuri and the O.A.C. No. 21 varieties, all of which originated from the small lots distributed through the medium of the Experimental Union. It will, therefore, be seen that the Experimental Union makes direct application of the information gained at the College by having experiments conducted on hundreds and even thousands of farms, and systematizes the co-operative work in such a way that the results of those experiments which have been conducted with care and accuracy can be summarized and made into valuable reports for the guidance of farmers generally. The point should be again emphasized that the Experimental Union is not only a source of gain in dollars and cents to the farmers but it is a great educational feature which has had a very wholesome influence not only on the agriculture of the Province, but on the men who have, themselves, been active in the work.

The following gives the list of the co-operative experiments in Agriculture conducted throughout Ontario in 1913:

Grain Crops.

	Plots.
1. Testing two varieties of Oats, including O.A.C. No. 72	2
2a. Testing O.A.C. No. 21 Barley and Emmer	2
2b. Testing two varieties of Two-rowed Barley	2
3. Testing two varieties of Hulless Barley, including Guy Mayle	2
4. Testing two varieties of Spring Wheat, including Marquis	2
5. Testing two varieties of Buckwheat, including Rye Buckwheat	2
6. Testing two varieties of Field Peas	2
7. Testing two varieties of Spring Rye, including O.A.C. No. 61	2
8. Testing two varieties of Soy, Soja, or Japanese Beans	2
9. Testing three varieties of Husking Corn	3

Root Crops.

10. Testing three varieties of Mangels, including Yellow Leviathan	3
11. Testing two varieties of Sugar Beets for feeding purposes	2
12. Testing three varieties of Swedish Turnips	3
13. Testing two varieties of Fall Turnips	2
14. Testing two varieties of Carrots	2

Forage, Fodder, Silage and Hay Crops.

15. Testing three varieties of Fodder and Silage Corn	3
16. Testing three varieties of Millet, including Japanese Panicle	3
17. Testing two varieties of Sorghum, including Early Amber	2
18. Testing Grass Peas and two varieties of Vetches	3
19. Testing Rape, Kale and Field Cabbage	3
20. Testing three varieties of Clover	3
21. Testing two varieties of Alfalfa, including Ontario Variegated	2
22. Testing four varieties of Grasses	4

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CULINARY CROPS.

23. Testing three varieties of Field Beans 3
24. Testing two varieties of Sweet Corn, including Golden Bantam 2

FERTILIZER EXPERIMENTS.

25. Testing fertilizers with Potatoes 6
26. Testing fertilizers with Mangels 10
27. Testing fertilizers with Barley 10

MISCELLANEOUS EXPERIMENTS.

28. Testing Extra Early Eureka and Davies' Warrior (late) varieties of Potatoes.. 2
29. Testing three grain mixtures for grain production 3
30. Testing three grain mixtures for fodder production 3

AUTUMN SOWN CROPS.

31. Testing three leading varieties of Winter Wheat 3
32. Testing two leading varieties of Winter Rye 2
33. Testing five fertilizers with Winter Wheat 6
34. Testing Autumn and Spring applications of Nitrate of Soda and Common Salt with Winter Wheat 5
35. Testing Winter Emmer and Winter Barley 2
36. Testing Hairy Vetches and Winter Rye as Fodder Crops 2

In 1913, as in former years, each farmer who wished to experiment sent in an application for the definite experiment which he desired to carry out. In nearly all cases we were in a position to send the applicant the material for which he applied, although a few who made requests late in the season were unable to secure the varieties asked for owing to the limited supply of some of the choice material.

The experimenters reported the results of their individual experiments on blank forms furnished them in the spring of the year. The reports of the co-operative experiments for 1913 which have been received have been submitted to a very critical examination. For the summary which is presented at this time only the results given in those reports which were complete in all essential features and showed carefulness and reliability throughout were used. Many of these reports have been furnished by men who have had a large amount of practical experience on the farm, have had the advantage of a good education, and have had a careful training in experimental work, as they have conducted successful tests on their own farms in each of several years past. It should be remembered, that while only the good reports of carefully conducted experiments have been used for publication, many of those not included in the summary showed that the individual experimenters must have obtained a considerable amount of value from their work, and in some instances a start with choice seed of varieties particularly suited to their own farms. It occasionally happens that owing to some unavoidable accident, an experiment may have been injured to some extent so that the results could not be used in the general summary, and yet the experiment may have furnished useful lessons to the farmer conducting it. In all cases, experimenters obtain much more information from the work which they conduct than can be given in a summary report such as the one here submitted.

The instructions for conducting the co-operative work which were furnished each experimenter, contained a request for the experimenter to give his decision as to the relative standing of the different varieties, mixtures, quantities of seed, fertilizers, manures, etc., after everything had been taken into consideration. The summary of the answers to this line of inquiry is presented in the tabulated results under the heading of comparative value.

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Grain Crops.

The areas devoted to some of the principal grain crops in Ontario in 1913 were as follows: Oats, 2,699,459 acres: Barley, 623,658 acres: Fall Wheat, 646,533 acres: Spring Wheat, 116,581 acres; Rye, 118,429 acres; Buckwheat, 228,279 acres; Peas, 177,303 acres; Beans, 66,639 acres; and Corn for husking, 299,871 acres. Besides the areas used for the separate grains no less than 414,517 acres were used for growing grains in combination. The combination in most cases would probably be oats and barley. It will, therefore, be seen that grain growing in Ontario occupies a large area of the cultivated land of the Province. Many of the grain crops are now being grown with the direct object of feeding them to stock on the farm, while formerly one of the main objects was to sell the crops from the farm for a cash value. A few of the grain crops have been increasing in area quite rapidly in recent years such as, for instance, buckwheat and rye. The probability is that the area devoted to the grain crops of Ontario will likely be increased rather than diminished.

One of the greatest weaknesses in the agriculture of Ontario at the present time is the great number of varieties of certain classes of farm crops which are used. This is particularly true in the case of potatoes and of oats. There are so many varieties of each under cultivation that it is practically impossible for buyers or for co-operative societies to secure uniform lots of potatoes in large quantities for shipping, consequently, the buyers have been bringing in potatoes from New Brunswick, and oats from the Western Provinces where uniform products can be obtained in carload lots without much difficulty. We hope that in the near future decided changes will take place in Ontario, particularly through the organization of co-operative societies, the members of which organizations will confine themselves to one or two of the very best varieties of each class of farm crop in which a specialty will be made. This work is already taking form in some localities, and we sincerely hope it will increase in a substantial manner. While these references have been made in regard to oats and potatoes the same is not true of barley, as nearly all the barley now grown in Ontario is of the Mandscheuri and the O.A.C. No. 21 varieties. With the O.A.C. No. 72 oats as a late variety, and the O.A.C. No. 3 oats as an early variety, we hope that great assistance will be furnished in driving out many of the different kinds of oats which are grown in the Province, and that these two varieties may in the near future occupy somewhat similar positions as the Mandscheuri and the O.A.C. No. 21 varieties of barley have occupied in the past. It is the policy of the Department of Field Husbandry at the College to secure the best varieties of grain obtainable, no matter whether obtained through importation, by selection or as a result of cross-fertilization. After these most promising varieties of grain have made a high record in the experimental work at Guelph over a series of years they are distributed throughout Ontario for co-operative experiments. Much care, however, is exercised to distribute as few varieties as possible, but at the same time to give the farmers an opportunity of testing upon their own farms those kinds which are likely to prove the most serviceable. When a variety has given high results, both at the College and throughout Ontario, it is continued in the co-operative work for many years, as for instance, the Mandscheuri barley was distributed in the co-operative scheme every season for eighteen years. When it was found that the O.A.C. No. 21 barley had surpassed the Mandscheuri in the co-operative experiments for three or four years in succession, the Mandscheuri was dropped and the O.A.C. No. 21 is now taking its place. With the oppor-

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tunities which the farmers now have of securing some of the very best varieties which have been thoroughly tested out at the College and throughout Ontario they should think very carefully before introducing new varieties, especially from agents who travel from house to house throughout the country, and who sell new varieties in small quantities at comparatively high prices.

Experiments.	Varieties.	Comparative value.	Yield per Acre.		
			Straw (tons.)	Grain (bus.)	Grain (lbs.)
Oats (187 tests)	O. A. C. No. 72	100	1.44	52.14	1,773
	O. A. C. No. 3	58	1.09	43.34	1,474
	Alaska	57	.98	43.28	1,472
	Daubeney	49	.91	41.18	1,400
Six-rowed Barley (28 tests)	O. A. C. No. 21	100	.90	33.60	1,613
	Common Emmer	69	.93	24.82	1,191
Two-rowed Barley (5 tests)	Hanna	100	.76	28.83	1,384
	Two-rowed Canadian	96	.92	27.00	1,296
Hulless Barley (9 tests)	Black Hulless	100	.76	20.37	1,222
	Guy Mayle	100	.79	19.59	1,175
Spring Wheat (16 tests)	Marquis	100	1.15	20.79	1,247
	Wild Goose	81	1.30	20.29	1,218
Spring Rye (7 tests)	O. A. C. No. 61	100	1.27	19.97	1,118
	Common	67	.99	15.91	891
Buckwheat (3 tests)	Rye	100	.53	24.03	1,154
	Silver Hull	88	.54	19.72	946
Winter Wheat (18 tests)	Tasmania Red	94	1.43	24.16	1,450
	Imperial Amber	100	1.41	24.15	1,449
	American Wonder	100	1.35	23.24	1,394
	Banatka	67	1.31	22.71	1,363
	Crimean Red	78	1.30	21.93	1,316
Winter Rye (4 tests)	Mammoth White	100	1.44	25.54	1,430
	Common	58	1.39	22.14	1,240
Field Peas (30 tests)	Canadian Beauty	100	1.52	23.51	1,410
	Early Britain	83	1.25	22.05	1,323
Field Beans (20 tests)	Pearce's Improved Tree	100	1.14	21.47	1,288
	Marrowfat	86	.99	20.37	1,222
	Common Pea	86	.88	18.15	1,089
			Whole Crop		
Corn for Grain (7 tests)	Early California	100	11.18	[illegible]	3,223
	Gold Nugget	82	12.14	57.47	3,218
	Genesee Valley	91	8.70	45.57	2,552

In the tabulated results here presented the yield of straw as given in the fourth column from the left represents the total crop, less the amount of grain, and therefore, includes the chaff with the straw. The yield of grain is given in pounds as well as in bushels per acre in order that the results may be more clearly understood, and that certain comparisons may be made between the different classes of crops as well as between the varieties of each class. While it is true that the different classes of crops were grown on different farms throughout

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Ontario, yet as most experiments were conducted in a large number of localities the complete table enables one to make certain comparisons of the different classes of crops. Owing to the great variation in the weight per measured bushel of the different crops it is much easier to compare the results in pounds than in bushels per acre. It should be understood that in working out the number of bushels per acre, the standard weights per bushel have been used for each class of crop. Attention is again called to the fact that the figures in the third column from the left, under comparative value, are made up from the answers received from the experimenters in regard to the varieties after the farmers who conducted the experiments have taken everything into consideration.

Varieties of Oats. Of all the grain c ops of Ontario oats are the most important. The market value of this crop alone amounts to approximately $36,000,000 annually, although in the last two or three years the market value of the crop has been even greater than this. It will therefore be seen that an increase in the oat crop of only one per cent. means an annual increase of the value of the crop in Ontario of about one-third of a million dollars. An increase of one bushel per acre of the oat crop of the Province would be represented in money value by nearly 3,000,000 bushels or fully $1,000,000. A difference of about five per cent. in the percentage of hull in the oat crop of the Province would mean a difference of the value of this crop in Ontario of nearly $2,000,000. It will therefore be seen that the Ontario Agricultural College and the Ontario Agricultural and Experimental Union are thoroughly justified in giving considerable amount of attention to the improvement of this important crop, and we are very much pleased with the reports which we have to present in regard to improved varieties of oats, which we believe will be worth millions of dollars to the Province of Ontario. We ask that the results presented in the Annual Report of the Ontario Agricultural College, and also of the Experimental Union, be studied carefully in consideration of the possibilities of the improvements which are likely to be brought about in this valuable crop in Ontario in the near future.

We always ask each experimenter to name the variety of oats which is grown most extensively in his own county and as we usually have upwards of five hundred experimenters with oats each year the summary of the answers received is very interesting. It furnishes some excellent information in regard to the extent to which the varieties of oats are grown throughout the Province. In summarizing these answers for 1913 it was found that the most extensively grown varieties of oats were the Banner and the Siberian. The Banner was grown more extensively than the Siberian and these two varieties together were apparently grown on about two-thirds of the oat land of the Province. The other varieties grown most extensively as judged from the reports received, were as follows: Ligowa, Abundance, Sensation, 20th Century, Newmarket, Silver Mine, and Storm King. In 1912 the most extensively grown varieties as estimated last year, were in the following order: Banner, Siberian, Ligowa, Sensation, 20th Century, Irish White, Tartar King, and Storm King. In 1911 the order was as follows: Banner, Siberian, Ligowa, Sensation, 20th Century, Irish White, and Silver Mine. In 1910 the three most extensively grown varieties were the Banner, the Siberian, and the Ligowa. It will therefore be seen that in each of the past four years the reports place the three most extensively grown oats in Ontario in the following order: Banner, Siberian, and Ligowa. The full number of varieties mentioned as being extensively grown were 19 in 1910, 29 in 1911, 33 in 1912, and 31 in 1913. There are far too many different varieties of oats grown in Ontario. We believe that five good varieties or

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even a less number could be selected that would cover practically all of the conditions of the Province.

For the co-operative experimental work four varieties of oats were distributed in the spring of 1913, viz., the O.A.C. No. 72, the O.A.C. No. 3, the Daubeney, and the Alaska. These had all been distributed and grown in Ontario previously, with the exception of O.A.C. No. 3 which was sent out for the first time.

The summary results show that we have no less than 187 good reports of successfully conducted experiments with oats for 1913. This is a larger number of good reports with oats than we have had in any year previous. The average results of the experiments conducted in such a large number of localities are very interesting. They show that the O.A.C. No. 72 has given decidedly the largest yield of grain per acre, surpassing the variety coming next to it by an average of 8.8 bushels or 299 pounds per acre. Not only did it give the greatest yield of grain but it also produced a large yield of straw and was exceptionally popular with the experimenters. It should be clearly understood that the O.A.C. No. 72 is a late variety and that all the other three are early varieties of oats. The average results of the O.A.C. No. 3 and the Alaska are exceedingly close, although the first named variety is rather heavier in the straw. It will be seen that all the early varieties came comparatively close together in productiveness in the past year.

It is believed that there is a great future for the O.A.C. No. 72 variety of oats in Ontario. The crop grows to a good height, the plants usually stand up well, and the straw is abundant and of good quality. The head is spreading in its habit of growth and both the straw and the grain are of a pinkish white appearance. The pinkish color of the crop is usually quite noticeable in the ripening grain in the field and generally shows more or less distinctly after the grain has been threshed. The oats are of good quality having only about 27 per cent. of hull, which is less than the Banner by three or four per cent., less than Tartar King by about seven or eight per cent., and also less than most other varieties. The yield of both straw and grain per acre has been large in the comparative results both at the Agricultural College and in the co-operative experimental work throughout the Province. The O.A.C. No. 72 variety of oats was distributed for co-operative experiments in 1911, when it surpassed the Siberian, the Regenerated Abundance, and the Lincoln, producing an average of five bushels per acre more than the last named variety. The O.A.C. No. 72 oats were not used in the co-operative experiments in 1912, but the foregoing tabulated results show that in 1913 it surpassed each of the other varieties by fully eight bushels per acre.

In many seasons early oats do not yield as heavily as late varieties. Some people, however, prefer growing early oats, in some instances by themselves and in others in combination with barley. There are now nearly one-half million acres of oats and barley grown in combination in this Province. When these two grains are grown together it is important to secure varieties which will ripen at the same time. The early varieties of oats and the most prolific yielding varieties of barley are the best to select for this purpose. The varieties of oats which we have found the most suitable for mixing with either Mandscheuri or the O.A.C. No. 21 barley are the three which are included in the co-operative experiments in 1913, viz., the O.A.C. No. 3, the Daubeney, and the Alaska. As the results of experiments with the O.A.C. No. 3 it appears that the best combination to use at the present time is the O.A.C. No. 3 variety of oats and the O.A.C. No. 21 variety of barley. This forms a combination which is indeed difficult to surpass. The O.A.C. No. 3 variety of oats produces a good length of straw and stands up

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rather better than the Daubeney, and according to the reports of the experimenters the variety is somewhat less subject to the attacks of rust. The oats are produced in a spreading head, the grain is white, and the kernels are rather long. It is interesting to state that of all the varieties of oats which have been tested at the Agricultural College, of which there have been about three hundred, the O.A.C. No. 3 variety has produced the thinnest hull. This variety, therefore, is not only one of the highest yielders of the early oats but the quality of the grain is of the very best. It is probably true that a number of farmers in Ontario would still select oats which are short, plump, and very thick in the hull, simply because they give a heavy weight per measured bushel. As a rule, however, we have found that those varieties of oats which weigh the most per measured bushel are very frequently light yielders and of poor quality.

The Alaska variety of oats is one of our best early varieties. It gave practically as good yields throughout Ontario in 1913 as did the O.A.C. No. 3. In the experiments at Guelph for five years the Alaska, although a thin-hulled variety, produced nearly two per cent. more hull than the O.A.C. No. 3.

It will be seen that the Daubeney variety has taken the lowest place in the four variety competition in 1913. This has been one of the best early oats in Ontario but its place will likely be occupied to a great extent by the O.A.C. No. 3 which is a better all round early oat and one exceptionally suited for mixing with barley for growing in combination, as the O.A.C. No. 3 oats and the O.A.C. No. 21 barley ripen at practically the same time.

O.A.C. No. 21 Barley and Emmer. Barley forms one of the leading grain crops of the Province. In recent years the barley has been increasing in acreage and in yield of grain per acre. This is largely due to the work of the Ontario Agricultural College and of the Experimental Union. The barley crop in Ontario now amounts to about $11,000,000 per annum. As near as we can ascertain through an extensive enquiry of farmers, through the work of the Agricultural Societies in the Field Crop Competition, through the principal exhibitions such as the Canadian National, Toronto, the Provincial Winter Fair, Guelph, and the Eastern Winter Fair, Ottawa, about 94 per cent. of all the barley now grown in the Province belongs to the Mandscheuri and the O.A.C. No. 21 varieties. The Mandscheuri variety was imported to the College from Russia twenty-five years ago and all the barley of this variety now grown in Ontario was started from one pound which was sown at the College in 1889.

The O.A.C. No. 21 barley was originated at the College and started from one seed in 1903. It is a barley possessing comparatively stiff straw of good length. The heads are large and have six rows. The barley grains are of medium size and are of a bluish color under the hull. The variety yields heavily and the grain usually weighs two pounds or more per measured bushel over the standard for barley.

In each of four years the Mandscheuri and the O.A.C. No. 21 varieties were distributed in connection with the co-operative experiments over Ontario, and as the former was surpassed by the latter in yield of both grain and straw per acre, in strength of straw, and in freedom from rust, the Mandscheuri was dropped from the co-operative list and in each of the past four years the O.A.C. No. 21 has been continued in the distribution. As no other variety obtainable has given as good all round results as the O.A.C. No. 21 it was thought unwise to distribute any other variety of six-rowed barley, but as emmer had produced a high yield of grain per acre at the College it was considered advisable to distribute the emmer along with

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the barley in competition throughout the Province. In all years excepting 1913 there has been a close rivalry between these two grains in productiveness. In 1913, however, it will be seen that the O.A.C. No. 21 barley has surpassed the emmer in yield of grain per acre by 422 pounds, and also that the barley was more popular with the experimenters than the emmer. We know of no barley in Ontario which will equal the O.A.C. No. 21, which is perhaps even now grown more extensively than the Mandscheuri barley and which is capturing nearly all the prizes in the Field Crop Competitions and in the principal exhibitions of the Province.

Two-rowed Barley. Two-rowed barley is grown more extensively in Great Britain and in the European countries than the six-rowed barley. In Ontario, however, the results of the two-rowed varieties have not been equal to those obtained from the six-rowed barleys. There has been but little demand for two-rowed barley in Ontario as the results in the past have been rather unfavorable. In 1913 we have results of five successfully conducted experiments in which we find that the Hanna surpassed the two-rowed Canadian by nearly one hundred pounds of grain per acre, although the Two-rowed Canadian gave the highest yield of straw.

Hulless Barley. About fifteen varieties of hulless barley have been tested under similar conditions at the College. The Guy Mayle variety has made a good showing in productiveness and in quality of straw, surpassing the Black Hulless barley which is the best known of the hulless barleys in Ontario. In 1913, however, the Guy Mayle, although being popular with the experimenters and producing a little more straw than the Black Hulless, was surpassed by the last named variety by 47 pounds of grain per acre in the average results of nine experiments conducted in the past year.

Spring Wheat. The greatest amount of interest in spring wheat is taken in eastern and northern Ontario, and in these sections of the Province the amount of rainfall was exceptionally light in 1913. The yields of spring wheat, therefore, are lower than those which are sometimes obtained. The Marquis variety of spring wheat which was originated by Dr. Wm. Saunders and selected and introduced by his son Dr. C. E. Saunders, of the Central Experimental Farm, Ottawa, was used in our co-operative experiments for the first time. It is interesting to know that it surpassed the Wild Goose variety by about one-half bushel per acre. It was also quite popular with the experimenters.

Spring Rye. Our own variety of spring rye which has been introduced under the name of the O.A.C. No. 61 has been distributed throughout Ontario for co-operative experiments in each of two years. It surpassed the Common Spring Rye in 1912 by an average of 2.32 bushels per acre and in 1913 by an average of 4.6 bushels per acre. The O.A.C. No. 61 spring rye has made a very excellent record at the College, surpassing all of the other varieties which have been under experiment for the last six or seven years.

Buckwheat. There were 228,279 acres of buckwheat in Ontario in 1913. This crop has been increasing rapidly in the Province during the past twelve years at which time only about 88,000 acres of buckwheat were produced in Ontario. The Rye Buckwheat which was grown considerably in Nova Scotia has not been brought into general cultivation in Ontario. It has, however, given very high yields in our experiments at the College, surpassing all other varieties. We introduced it in our co-operative experiments in 1908 for the first time and it has now been distributed along with the Silver Hull variety in each of the past five years. The average results show that the Rye buckwheat surpassed the Silver Hull variety in yield of grain per acre by 5.5 bushels in 1908, 3.3 bushels in 1909, 6.3

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bushels in 1910, 4.3 bushels in 1911, 4.8 bushels in 1912, and 4.3 bushels in 1913, It will therefore be seen that there is a large amount of evidence to show that the Rye buckwheat is a much larger producer of grain than the Silver Hull variety. The flour of the Rye buckwheat is somewhat yellow in appearance and will probably not be as popular as that of the Silver Hull variety. The Rye buckwheat, however, makes a very thick growth and appears to be an admirable variety for smothering weeds. It has been more popular with the experimenters than the Silver Hull variety in the co-operative experiments throughout Ontario.

Winter Wheat. The results of the experiments with winter wheat were printed in the autumn of 1913 and distributed to all the co-operative experimenters and were sent to upwards of three hundred newspapers throughout the Province. After the results were published other reports were received and a summary of the tabulated returns in the table given in this report includes all the complete reports of the successfully conducted experiments with winter wheat during the last year. The Tasmania Red which has given the largest yield of grain per acre is a wheat of very good milling properties. It occupies a higher relative place in grain production in the co-operative experiments of 1913 than it has usually occupied, either in the co-operative experiments throughout Ontario or in the experiments at the College. It is, however, a very good all round wheat. The American Wonder which occupies third place on the list is of the Dawson's Golden Chaff type and usually takes a higher place in grain production. The Banatka and the Crimean Red varieties which occupy the lowest places in yield of grain in 1913 are two wheats which produce flour of superior quality for bread production.

Winter Rye. As in each of the past three years the Mammoth White Winter Rye has surpassed the Common variety in the co-operative experiments. The Mammoth White variety has also made a high record in the experiments at Guelph. In the co-operative experiments it has been decidedly the most popular variety distributed in the last few years.

Field Peas. For eight years in succession we have distributed field peas for co-operative experimental purposes. During the first four of the eight years the Early Britain made a high record. In each of the last four years, however, it has been surpassed by the Canadian Beauty, the results in 1913 being 87 pounds per acre in favor of the last named variety. Both are good varieties. The Canadian Beauty is a white and the Early Britain a brown pea. It was thought that possibly the Early Britain would not be quite as saleable as the white varieties, but it is a pea of excellent quality and one very desirable for the manufacture of split peas, as the manufactured product has a beautiful rich yellowish color.

Field Beans. The Pearce's Improved Tree Bean is a variety which has made a very high record in the experiments at Guelph. It will also be seen that in the average of twenty co-operative experiments in Ontario in 1913 it has surpassed both the Marrowfat and the Common pea beans. It surpassed the Common Pea Bean by practically 200 pounds of grain per acre and was the most popular with the experimenters. The Pearce's Improved Tree beans are white in color, are of medium size, and of good quality.

Soy Beans. As usual an experiment was conducted over Ontario with different varieties of Soy beans in 1913. No satisfactory reports, however, were received. The Early Yellow variety is the one which has made the best all-round record at Guelph, although we have now a selection from this variety which promises to be better than any of the varieties which we have previously had under experiment.

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Corn for Grain Production. It has been usual in the co-operative experiments to include one dent variety with two flint varieties of corn for tests in connection with grain production. In 1913, however, three flint varieties were used for this experiment, viz., the Early California, the Gold Nugget, and the Genesee Valley. The Gold Nugget has given particularly good results at Guelph. It is, however, a little later than the other two varieties and it did not quite equal in grain production in 1913 the Early California variety. In yield of whole crop, however, the Gold Nugget surpassed both the Early California and the Genesee Valley. It is rather peculiar that this year the flint corns, which were grown for grain, produced a greater yield of total crop per acre than the dent corns, which were grown for fodder purposes, the results of which are presented in another part of this report.

Mixtures of Grain for Grain Production.

There is probably no place on the American continent where a larger amount of systematic work has been carried on in a study of various combinations of grain crops to be sown for the production of grain for threshing. The work was started at the College about twenty years ago, and each experiment which has been undertaken has suggested others until quite a number of distinct tests have been carried on in duplicate in each of five years. It has been found but little advantage to grow in combination two varieties of the same kind of grain. It has been ascertained, however, that varieties of different classes of grain can in some cases be grown in combination to marked advantage. The results of experiments show that two bushels of oats and one bushel of peas grown in combination make an admirable mixture for the production of green fodder or of hay. Other experiments show that oats and barley of the right varieties when grown together in the right proportions, will give a yield of about two hundred pounds of grain per acre more than either one when grown alone.

The Ontario Agricultural and Experimental Union has conducted experiments with mixed grains throughout Ontario, based on the work which has been carried on at the College. In 1909, an experiment was conducted with different varieties of oats, barley and spring wheat, which were grown in combinations of two and three kinds of grain together for the fifth year in succession. The results of the five years' experiments showed that throughout Ontario one bushel of the Daubeney oats and one bushel of the Mandscheuri barley gave a higher yield of grain per acre than any of the other mixtures used in this experiment. In 1910, a co-operative experiment was conducted for the first time throughout Ontario in testing three different proportions of oats and barley in order to find out which one would give the largest yield in the average of the different soils of the Province. In 1910 the varieties used were the Daubeney oats and the Mandscheuri barley, in 1911 the Alaska oats and the O.A.C. No. 21 barley, in 1912 and in 1913 the Daubeney oats and the O.A.C. No. 21 barley.

The results of the experiments in 1912 were too few and incomplete to be reported in tabulated form. The average results of the experiments in each of the other three years are as follows:

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Varieties and Combinations.	Seed per Acre.			Yield per Acre.							
				Tons of Straw.				Pounds of Grain.			
	Bushels.	Pounds.		1910.	1911.	1913.	Average.	1910.	1911.	1913.	Average.
Oats	½	17	41	1.32	.75	.97	1.01	1,528	1,420	1,260	1,403
Barley	½	24									
Oats	1	34	82	1.47	.93	1.25	1.22	2,104	1,820	1,510	1,811
Barley	1	48									
Oats	1½	51	123	1.61	1.29	1.63	1.51	2.096	1.594	1.700	1.797
Barley	1½	72									

The results for 1910 and for 1911 correspond exactly with the results of similar experiments conducted at the College, viz., that one bushel of oats and one bushel of barley used together, making a combination of two bushels of seed per acre, has produced a greater yield of grain than either a lighter or a heavier seeding. In 1913, however, the average results for the four experiments show that the heavier seeding produced the largest crop of grain. This is probably due to the comparatively dry season of 1913, in which case a greater number of plants on a certain area would be necessary. The average results for the three years show that the highest returns were from the medium quantity of seed per acre, viz., one bushel of oats, and one bushel of barley, or a combination of two bushels per acre.

Field Roots, Fodder Crops, Grasses, Clovers and Alfalfa.

In the past year experiments have been conducted with mangels, sugar beets for feeding purposes, swede turnips, fall turnips, field carrots, fodder corn, millet, grass peas, vetches, rape, kale, field cabbage, grasses, clovers and alfalfa. For some of these crops there were only a few applications, and in some of those which were conducted to a limited extent we have not received a sufficient number of the good reports of carefully conducted experiments so as to include the summary in tabulated form. In the majority of the tests, however, we received a sufficient number to enable us to present results which are valuable as a general guide in regard to the different varieties as grown throughout the Province. We always find it difficult to get full reports of experiments with grasses, clovers, alfalfa, etc., in a way to present in the form of a table. These different crops are not ready for cutting at the same time, and the weather conditions sometimes make it very difficult, indeed, to give uniform weights of either the green crops or of the hay. The summary results of the successfully conducted experiments belonging to these crops are presented as follows:

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Experiments.	Varieties.	Comparative Value.	Yield per acre. (tons).
Mangels (5 tests)	Yellow Leviathan (Ferry)	100	32.50
	Sutton's Mammoth Long Red	50	30.10
	Ideal (Kirsche)	63	28.04
Sugar Beets (5 tests).	Bruce's Giant White Feeding.....	100	26.54
	Rennie's Tankard Cream.....	88	25.09
Swede Turnips (2 tests)	Bruce's Giant King.....	100	12.94
	Steele-Briggs' Good Luck	73	12.49
	Carter's Invicta	73	11.39
Fall Turnips (2 tests).	Sutton's Imperial Green Globe	100	17.47
	Red Top White Globe	92	16.93
Carrots (4 tests)	Bruce's Mammoth Intermediate Smooth White	100	21.35
	Steele's Improved Short White	100	20.05
Fodder Corn (5 tests).	Late White Cap Yellow Dent.....	83	9.28
	Wisconsin No. 7	92	8.94
	Early White Cap Yellow Dent	100	7.11
Grass Peas and Vetches (2 tests)	Hairy Vetches.....	100	7.67
	Grass Peas	97	7.51
	Common Vetches	78	5.33

Mangels. It might be well at the outset to state that there are four distinct classes of mangels grown to a greater or lesser extent throughout the Province of Ontario, viz., the long, the intermediate, the tankard and the globe. It is probably safe to say that a few years ago the Long Red was grown much more extensively than any of the other classes. At the present time, however, the intermediate class is increasing rapidly, and is becoming very popular with the farmers. We have found great variations in yield per acre even of the intermediate mangels, some of them producing high, others giving comparatively low results.

In 1913, three varieties of mangels were distributed for co-operative experiments throughout Ontario. These represented the long, the intermediate, and the tankard classes. In 1912, Ontario grown seed of the Ideal mangel was distributed, and the results of seven successfully conducted experiments showed that the Ideal came first, the Yellow Leviathan second, and the Sutton's Mammoth Long Red third. In 1913, however, the seed was all imported, and it will be seen that the Ideal occupies lowest place in both yield of roots per acre, and in popularity with the experimenters. The Yellow Leviathan variety belongs to the intermediate class of mangels, and has been distributed throughout Ontario in each of the last eleven years, during which time it has outyielded the Long Red variety in nine out of the eleven years. In connection with the experiments at the College, and throughout Ontario, the Ferry's Yellow Leviathan intermediate mangel and the Kirsche's Ideal Tankard mangel have made high records. The seed of the Yellow Leviathan mangel was first obtained by the Ontario Agricultural College from D. M. Ferry, of Windsor, Ontario, in the spring of 1893. The name "Yellow Leviathan" was entered in the catalogues of some of the other seedsmen, as follows: The Steele-Briggs Seed Co., Toronto, in 1896; Jas. Hewer,

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Guelph, in 1908; the Wm. Rennie Seed Co., Toronto, J. A. Simmers, Toronto, and Jno. A. Bruce, Hamilton, in 1909; and Geo. Keith, Toronto, in 1910. We have found that the seed obtained from different seedsmen in Ontario under the name of Yellow Leviathan has varied considerably in germinating power of the seed, and in shape, size and color of the roots.

Sugar Beets for Feeding Purposes. The so called Sugar Beets are grown in Ontario for two distinct purposes. Those varieties which have been bred in Germany for years for high sugar content are grown considerably in the vicinities of Berlin and Wallaceburg, where the sugar beet factories are located. The sugar beets for feeding purposes, or the sugar mangels are grown to a limited extent throughout Ontario for the production of feed for farm stock. On the average the former will produce about fifteen per cent. and the latter about ten per cent. of sugar. The sugar mangels grow largely out of the ground, and are much more easily harvested than the sugar beets which are produced for sugar production. For co-operative work in Ontario two varieties of sugar mangels have been selected from the large number of different kinds which have been under experiment at Guelph, and these two were distributed in the spring of the present year. The Bruce's Giant White Feeding surpassed the Rennie's Tankard Cream by about one and one-half tons of roots per acre in the average of the experiments conducted on five Ontario farms. In 1912, the two varieties used were the Rennie's Tankard Cream, and the Steele-Briggs' Royal Giant, the former surpassing the latter by about two tons of roots per acre.

Swede Turnips. The acreage devoted to swede turnips in Ontario has been gradually decreasing in recent years, although there are still about one hundred thousand acres used for turnip growing in the Province. The results of the tests of the three varieties used in the co-operative experiments in 1913 are all comparatively low, the yield being only about one-half of that of 1912.

Fall Turnips. The fall turnips are grown only to a limited extent in Ontario. They usually yield more than the Swede turnips per acre, but do not keep as well into the winter.

Field Carrots. Formerly, the White Belgian carrot was grown quite extensively in Ontario. This variety produces long slender roots which yield about five tons per acre less than the Intermediate White varieties, and is very difficult to harvest. There seems to be but slight difference in the named varieties of White Intermediate carrots, except in some seasons when there is a marked variation in the germination, in the purity of the varieties, etc.

Fodder Corn. Within the last few years the area used for fodder corn in Ontario has been increasing to a considerable extent. There is probably no crop in which it is more important to secure varieties which will give the best all round results under the special conditions in which the corn is grown. The variety which will give the most satisfactory results depends largely upon the quality of the soil, the condition of the underdrainage, the amount of rainfall, the temperature during the growing season, etc. We have had under test at the Ontario Agricultural College a large number of varieties of corn, and have conducted careful tests with these various kinds, the results of which have been published from year to year in the Annual Report of the College. It is important, however, to carry on co-operative work to enable the farmers to find out for themselves which of the leading varieties will give the best results upon their own particular farms. For this purpose three varieties have been distributed each year, and the results of the experiments are watched by those who conduct the experiment.

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A slight change was made in the co-operative experiments of the present year. Instead of sending out three distinct varieties, only two named kinds were distributed, but of one of these kinds an early and a late strain was used. As the White Cap Yellow Dent corn has been grown for a number of years by different farmers, especially in the South-western part of Ontario, these men have selected their seed according to their own ideals. As a result there are marked variations in the earliness, in the size of the plant, and in the yield of grain per acre of the different strains of the White Cap Yellow Dent. In comparison with these two strains the Wisconsin No. 7 was used. This is a more uniform variety, as it is the result of close plant selection work conducted at the Agricultural College, in the State of Wisconsin. As a result of the five tests made with these three lots of corn it will be seen that the Wisconsin No. 7 occupies the intermediate place in yield of total crop per acre, and also in comparative value as determined by the experimenters. The yields are all comparatively low this season. It is interesting to note that the Early White Cap Yellow Dent, although the smallest producer, was the most popular with the experimenters. These results emphasize the importancce of growing corn in the different localities which will reach a good stage of maturity before the heavy frosts appear.

Vetches and Grass Peas. In each of the past fifteen years experiments have been conducted throughout Ontario in the testing of grass peas, common vetches and hairy vetches. These three leguminous crops produce fodder rich in digestible nutrients, and are very easy on the land as they obtain a considerable portion of their nitrogen from the atmosphere. Each of these crops has been grown in Ontario to a limited extent. The Common Vetches have been used more particularly for mixing with oats for the production of green fodder or of hay than they have for sowing in a crop by themselves. They usually give comparatively poor results when sown alone. The Hairy Vetches are more suited for growing alone than for growing in combination with other crops. They are used considerably by fruit growers to sow as a cover crop in the orchards. In the co-operative experiments over Ontario the greatest yield of fodder per acre of these three leguminous crops was produced by the Hairy Vetches in 1899, 1900, 1901, 1902, 1906, 1907, 1908, 1909, 1911 and 1913, so that on the average the Hairy Vetches have given rather higher yields per acre than the grass peas and considerably higher yields than the Common Vetches. The seed of the Hairy Vetches, however, is expensive, although it has been grown to a certain extent in Norfolk County and in the Niagara Peninsula. Some farmers are growing this crop by mixing it with rye as in this way it keeps the vetches off the ground, and is conducive to the production of a fairly good yield of seed of good quality.

Sweet Corn for Table Use.

We have no statistical reports in regard to the amount of Sweet Corn grown in Ontario. This class of corn is grown for table use at home, for canning purposes, and for the production of fodder for farm stock. For the latter purpose it is important to grow a variety which gives comparatively large yields of stalks, leaves and ears, and which reaches a good stage of maturity in the locality where it is grown before there is danger of severe frost. If, however, the object is to grow corn for canning purposes it is wise to grow those varieties which will produce a good yield of ears, the grain of which is sweet and the most suitable for cutting in the green state for canning. If, however, the corn is grown for table use at home it is important to have grain which is sweet, juicy and tender, and ears which are com-

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paratively small and nave only a small number of rows, eight being the most desirable number. In connection with the experimental work at the Ontario Agricultural College fully fifty varieties of sweet corn have been under test. These different varieties have all been studied in the field, and many of them have been tested for table use. For the co-operative experiments, three varieties have usually been distributed to farmers throughout Ontario so that they could ascertain for themselves which one of the three would prove the most serviceable for their private use. In most years three early varieties have been used such as the Golden Bantam, the Mammoth White Cory, and the Malakhoff. In 1913, however, only two varieties were selected for distribution, one being the kind which has proven the most desirable as an early corn, and the other being a standard late variety, the early corn being the Golden Bantam, and the late the Stowell's Evergreen. The following table gives the average results of twenty successfully conducted tests with these two varieties under similar conditions in the past year:

Experiment.	Varieties.	Comparative Value.	Number of Ears.	Number of days until ready for table use.	Table Quality.	
					Flavor.	Juiciness.
Sweet Corn (20 tests)	Golden Bantam.....	100	143	92	100	100
	Stowell's Evergreen..	73	128	107	77	91

As has been the case in each of a number of years, the Golden Bantam has come to the top of the list. This is a most excellent corn for home use. It is the choice variety of all those which have been under experiment at the Ontario Agricultural College. In 1913, the Golden Bantam surpassed the Stowell's Evergreen in number of ears per plot, in earliness, and in table quality of the grain which includes both flavor and juiciness. It is also placed higher than the Stowell's Evergreen by the experimenters, taking everything into consideration. The Stowell's Evergreen has been grown quite extensively in Ontario in past years, and is considered one of the best of the late varieties of sweet corn. The Golden Bantam, which is a most delicious table corn, is increasing in its growth throughout Ontario, and we believe that as time advances its growth will become even more general. This corn might be grown with but little difficulty in practically all of the farm gardens throughout the Province. When it is planted at two or three different dates the length of season in which the corn is in the best condition for table use is considerably extended.

Millet. Again in 1913 three varieties of millet were used for the co-operative experiments. The demand, however, was not very large, and the number of experiments, therefore, were quite limited and no satisfactory reports have been received. In the experiments at the College, and in the co-operative experiments of other years the Japanese Panicle variety has furnished a large yield of fodder, and this variety has been popular with the experimenters.

Rape, Kale, and Field Cabbage. Experiments have been conducted at the Agricultural College for a number of years in testing about twenty varieties of rape, kale and field cabbage as crop producers. These have given high yields per acre, especially the field cabbage. In each of the past few years the Dwarf Essex Rape, Thousand Headed Kale, and Sutton's Earliest Drumhead cabbage have been

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used for the co-operative experiments. Each have given very good yields; unfortunately, however, we have no good reports of this experiment for 1913. The field cabbage has made exceptionally high yields per acre in other experiments, the yield usually surpassing that of rape by a few tons per acre, and generally surpassing considerably the average yield of corn.

Clovers. In each of several years past the seed of Red Clover, Alsike Clover and Mammoth Red Clover has been distributed for co-operative experiments throughout Ontario. It has been found very difficult to present in tabulated form the summary results obtained from these co-operative experiments, owing largely to the fact that the crops are ready to harvest at different times, and under different weather conditions, and the fact that Red Clover produces two crops and the others only one main crop in the season. The Mammoth Red Clover has usually produced the highest yield in the first cutting, but when the total crop in each season was taken into consideration there has not been much difference in the amount of hay per acre from the Common Red and the Mammoth Red varieties.

Grasses. The Tall Oat, Orchard Grass, Meadow Fescue and Timothy have been distributed throughout Ontario for co-operative experiments in each of several years. The accumulated results of this experiment may be presented in detail in a future report. The hardiness of these varieties is an important feature as well as the productiveness. The Tall Oat and the Orchard Grass have each given an early growth of crop in the spring. The Tall Oat has usually been a higher producer of hay, and at the College has given more pasture than any other variety of grass, but the seed is rather expensive and difficult to secure in a pure condition.

Alfalfa. Alfalfa, or as it is frequently called, Lucerne, is becoming more and more an important crop in Ontario. It is grown the most extensively in the Counties of Haldimand, Lincoln, Welland, Wentworth, Brant, Huron and Lambton, although in many other counties it is becoming an important crop.

The information obtained from experiments in growing alfalfa at the College is most convincing, and shows that there is a very great difference in the various kinds of alfalfa in regard to hardiness. Some varieties will withstand our severest winters very well, while others under exactly similar conditions will become almost completely killed out. We have found that the Ontario Variegated and the Grimm alfalfa have each proved to be quite hardy, and will frequently withstand the winters, while the common seed obtained from the Western States will become completely winter killed.

We have been able to trace the history of the Ontario Variegated alfalfa back for fully forty years in the Province of Ontario. In that length of time the more tender plants had an opportunity of becoming killed out, and the hardier ones have remained as seed producers. It is called Variegated from the fact that it is apparently a natural hybrid between the Common violet flowered alfalfa, and the Wild Yellow flowered alfalfa of some of the European and Asiatic countries. The yellow flowered alfalfa (*Medicago falcata*) is usually a very hardy variety, and has perhaps added hardiness to some of the plants of the hybrid, which are the ones that have withstood the Ontario winters. The Common alfalfa has violet flowers, and coloring matter appearing in different degrees of density, extending from a comparatively deep to a very pale violet, the latter being almost white. The flowers of the Variegated alfalfa include shades of green, blue and yellow, and various blends of these with each other and with violet.

In each of the past few years the Ontario Variegated and the Grimm alfalfas have been distributed throughout Ontario, but we are not as yet prepared to give

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tabulated summaries of the results. The growth of the two varieties will be watched carefully and their hardiness determined from year to year.

In the spring of 1913, the Grimm alfalfa was distributed in twenty pound lots to each of twenty of the County Representatives in Ontario. An experiment was conducted on an acre plot in each County. The acre was divided into four sections. One-quarter of an acre received the pure alfalfa seed, another section received seed which had been inoculated, another section received lime, and the fourth section received both inoculated seed and lime. We would suggest that the people in the different counties watch carefully the results of the experiments in their own counties. For further information regarding the alfalfa, the reader is referred to the Annual Report of the Agricultural College, and also to a bulletin which will likely be distributed before this report is printed.

Varieties of Potatoes.

There were practically one hundred and sixty thousand acres of potatoes grown in Ontario in 1913. The market value of this crop amounted to nearly 12,000,000 dollars in 1911, and to upwards of 13,000,000 dollars in 1912. The greatest areas used for potato growing in Ontario in 1913 were in the Counties of Simcoe, York, Middlesex, Grey, Carleton, Hastings and Wellington, and in the order here named. Each of these Counties had upwards of 5,000 acres. The highest yields per acre in 1913 were produced in Northern Ontario, especially in Algoma and in the Rainy River and Kenora districts, and the lowest yields per acre were produced in Prince Edward, Haliburton, Essex, Muskoka, Grey, Welland, Peterborough and Hastings in the same order as here given.

In 1913 an enquiry was made from the various experimenters regarding the most extensively grown varieties of potatoes in the various counties of Ontario. In all, fifty-seven varieties were mentioned one or more times as being the most extensively grown in the different counties. The following gives the names and the order of the varieties which were mentioned the greatest number of times: Rural New Yorker No. 2 and Carman, each 28 times; Delaware, 24 times; Irish Cobbler, 23 times; Green Mountain, 15 times; Empire State, 14 times; American Wonder, 13 times; Carman No. 1, Early Rose, and Dooley's, each ten times; Early Ohio, 8 times; Carman No. 2 and Gold Coin, each 6 times; and White Elephant, Beauty of Hebron and Extra Early Eureka, 4 times. In 1912, the varieties which were mentioned the greatest number of times were in the following order: Rural New Yorker No. 2, Green Mountain, Empire State, White Elephant, Early Rose, Irish Cobbler, Delaware, Early Ohio, Beauty of Hebron, Carman No. 1 and American Wonder. As some reporters mention Carman No. 1, others Carman No. 3, and still others simply Carman, it is difficult to classify these varieties. If we take into consideration enquiries which were made in each of the past seven years we find that the Rural New Yorker No. 2 has been grown more extensively than any other variety, and this variety has been followed by the Empire State as the second most extensively grown variety.

In 1912, two varieties of late potatoes, two varieties of medium potatoes, and five varieties of early potatoes were used in the experimental competition. As most of these varieties have been tested for several years, and as the Davies' Warrior had made the highest records of the late potatoes, and the Extra Early Eureka of the early potatoes, it was decided that in 1913 the experiments would be confined entirely to these two varieties. The report, therefore, for the present year occupies

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a very small space, but it will be seen that these two varieties of potatoes were successfully tested on no less than 310 farms in Ontario. It might also be stated that the successful reports were received from forty-eight counties and districts of the Province. Those counties which furnished the largest number of good reports of successfully conducted experiments with potatoes were as follows: Huron, 22; Middlesex, 19; Lambton, 17; Bruce, 14; York, 12; Nipissing, Welland and Wellington, 11; and Norfolk, 10.

The following table gives the average results of the co-operative experiments with two varieties of potatoes successfully tested on 310 farms in Ontario in 1913:

Experiment.	Varieties.	Comparative Value.	Per Cent. of Small Tubers.	Mealiness when Cooked.	Bushels of Whole Crop per Acre.
Potatoes (310 tests).....	Davies' Warrior.....	93	16	95	134.11
	Extra Early Eureka.....	100	14	100	125.76

The Davies' Warrior variety of potatoes has given excellent results at the College, and has headed the list in each of the last three years in which it has been distributed. The results for 1913, however, were less favorable for this variety than usual. This we believe to be owing to the fact that the Davies' Warrior is a late ripening variety, and that the peculiar weather conditions of the last season in which in many localities there was a dry spell, followed by rains, proved to be unfavorable for this variety. This caused a second growth, and kept the potatoes very green in the autumn, and produced an unusually large number of small potatoes. Not only did this cause small potatoes, but it also prevented the tubers of the Davies' Warrior variety becoming as high in mealiness as usual. The seed, however, which was produced should be of excellent quality for planting next spring. In Scotland, and also in some parts of the southern United States, potatoes are allowed to become only partly matured in the production of tubers to be used for seed. Even under the unfavorable conditions the Davies' Warrior gave an average of 134 bushels per acre, which was about 8 bushels per acre more than the Extra Early Eureka, and about 14 bushels per acre more than the average yield of the potato crop of Ontario for 1913. According to past results the Davies' Warrior has produced large average yields, and the potatoes have been of good quality, and exceptionally free from rot when that trouble was so prevalent. The Extra Early Eureka, which is apparently a selection from the Irish Cobbler, has made uniformily good returns both at the College and throughout Ontario in past years. The Extra Early Eureka variety was also one of the freest from rot in 1912 when the rot was so prevalent in Ontario, and when so many of the other varieties became badly diseased. Taking all the results of the past eight years, the Davies' Warrior of the late potatoes, and the Extra Early Eureka of the early varieties, have made exceptionally fine records.

Fertilizers with Farm Crops.

The co-operative work with fertilizers and farm crops in connection with the Experimental Union has been conducted for a period of twenty-one years. In the earlier stages of this work the experiments were very simple and those appointed

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to look after the experiments were feeling their way as to the best methods to adopt in a system which was not too complicated to be carried out on the private farms, and yet which would give the experimenters useful information and at the same time would furnish results to the Experimental Union which might be of general value. As time has advanced the experiments have become somewhat more elaborate and necessarily somewhat more complicated. As a number of the experimenters in connection with the Association have been carrying on tests successfully for a number of years, they are now in a position to conduct fertilizer work much more satisfactorily than could possibly have been done twenty years ago. We are now conducting with much satisfaction a test with fertilizers and barley of a very similar nature to the co-operative experiments undertaken about twenty years ago in the United States under the direction of Dr. Atwater, and which work proved to be a failure owing, no doubt, to the fact that the experiment was too complicated for the man who had received no previous training in co-operative experimental work.

After the preliminary work had been carried on our first general plan included experiments with fertilizers with oats, fodder corn, and mangels. It was revised somewhat for the experiment with winter wheat, and also to a greater extent with potatoes. The only crop used in 1913 according to the general plan adopted about fifteen years ago was the one with winter wheat. The co-operative experiments with fertilizers and potatoes, mangels and barley, are all under somewhat different plans which have been arranged according to experience obtained from the former co-operative experiments conducted by the Union. The Association is now doing some excellent work with fertilizers and it expects to improve upon its present plans from time to time.

For the co-operative experiments the fertilizers and the seeds have been sent from the College to experimenters each year. In the original plan the nitrate of soda and the muriate of potash were applied at the rate of 160 pounds per acre, and the superphosphate at the rate of 320 pounds per acre. A mixture or complete fertilizer was composed of one-third the amount of these fertilizers, and was, therefore, applied at the rate of 213⅓ pounds per acre. Both the Royal Canadian and the potato fertilizer used in each of five years with the potato crop was applied at the rate of 320 pounds each per acre. The nitrate of soda was applied when the plants were about three inches in height, and all the other fertilizers at the time of sowing the seed. Farmyard manure was used in the experiment for the past ten years. The advice to each experimenter was to apply 500 pounds of average cow manure per plot, the application being equal to twenty tons per acre. The cow manure was mixed with the soil to a depth of from four to five inches, and the fertilizers were stirred in the soil to a depth of from one to two inches.

The foregoing description applies to all the co-operative experiments with fertilizers conducted previous to 1910, also those conducted in 1911 with winter wheat and with potatoes, and in 1912 and in 1913 with winter wheat. Another experiment with fertilizers and barley was started in the spring of 1910, another with fertilizers and mangels in 1911, and still another with fertilizers and potatoes in 1912. The table here presented gives the average results of the co-operative experiments with fertilizers as described in the foregoing paragraphs:

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Kind of Fertilizer used.	Average Yield per acre.								
	Fertilizer per Acre.		Oats.	Winter Wheat.	Fodder Corn.		Mangels.	Swede Turnips.	Potatoes.
					Total.	Ears.			
	Exact weight.	Approximate cost.	5 yrs. 74 tests.	9 years. 23 tests.	8 yrs. 47 tests.	8 yrs. 41 tests.	5 years 41 tests.	5 years 18 tests.	5 yrs. 98 tests.
	Lbs.	$ c.	Bush.	Bush.	Tons.	Tons.	Tons.	Tons.	Bush.
Nothing	.....	.....	38.9	17.7	8.2	2.7	20.6	19.6	129.2
Nitrate of Soda	160	4 80	46.3	21.6	9.4	3.1	26.5	22.5	153.4
Muriate of Potash	160	4 00	43.8	21.3	9.4	3.0	24.6	23.7	160.8
Superphosphate	320	3 92	43.6	20.9	9.0	3.1	24.2	24.7	156.8
Complete Fertilizer	213	4 24	48.7	23.6	9.4	3.2	25.4	25.0	166.8
Potato Fertilizer	320	5 52	.....	.....	.....	.....	.....	.....	167.5
Royal Canadian	320	5 60	.....	.....	.....	.....	.....	.....	164.5
Cow Manure	40,000 (20 tons)	6 00	.....	24.5	.....	.....	.....	26.9	174.7

The cost of each fertilizer as given in the table represents very closely the average cost per acre for the fertilizers as used in the co-operative experiments. The quotations were based on the factory price for quantities of about one ton of each fertilizer. The twenty tons of cow manure would mean about twelve good-sized loads per acre, and manure in Guelph has been selling at fifty cents per load, which is probably about the average for the Province. It is exceedingly difficult to place a price on farmyard manure, as in most cases it is not purchased, but is produced on the farm. Each person may place such value on the manure as he deems expedient, and study the results according to his own circumstances. It should be stated that the freight on the fertilizers and the application of both the fertilizers and the manure are not taken into consideration in the foregoing statement, nor yet is there any account made of the influence of the different fertilizers and the manure upon the land after the first season.

If we take into consideration the increases in the yields per acre from the different fertilizers and the average price of the fertilizers per acre, as indicated in the foregoing table, we would find that the increases in the different crops were made most economically by the fertilizers, as follows: Complete fertilizer with oats gave an increase of 9.8 bushels per acre at a cost of about 42 cents per bushel; the complete fertilizer with winter wheat gave an increase of 5.9 bushels per acre at a cost of about 72 cents per bushel; the muriate of potash with corn gave an increase of 1.2 tons per acre at a cost of about $3.33 per ton; the nitrate of soda with mangels gave an increase of 5.9 tons of roots per acre at a cost of about 81.4 cents per ton, or 2.5 cents per bushel; the complete fertilizer with Swede Turnips gave an increase of 5.4 tons per acre at a cost of 78.5 cents per ton, or 2.4 cents per bushel, and the complete fertilizer with potatoes gave an increase of 39 bushels per acre at a cost of 10.9 cents per bushel. Each experimenter was asked to conduct his fertilizer test on the average soil of this farm. The results here presented are, therefore, for the average soils of Ontario. On some farms the fertilizers paid much better than they did on others. Every farmer who uses fertilizers should know as much as possible in regard to the requirements of his own particular farm. The results here presented speak in a very general way regarding the use of these fertilizers under the varying conditions of farms of the Province.

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Ten Plot Experiment with Fertilizers and Barley.

In 1910 arrangements were made for conducting an experiment with fertilizers and barley throughout Ontario. The experiment consisted of ten plots, seven of which received commercial fertilizers, one lime, one cow manure, and one was left unfertilized. For the seven plots which received commercial fertilizers, nitrate of soda, superphosphate and muriate of potash were used singly and in combination of two and three together. The number of pounds per acre of each fertilizer used was 100 for both the nitrate of soda and the muriate of potash and 200 for the superphosphate, whether these were sown separately or in combination. The freshly slaked lime which was used in 1910, and the hydrated lime used in 1911, in 1912, and in 1913, was applied at the rate of 1,400 pounds per acre, and the cow manure at the rate of twenty tons per acre. As in the case of the other fertilizer experiments, the nitrate of soda was applied in every instance when the plants were about three inches in height, and all the others were applied at the time of seeding. All the other applications for the fertilizer experiments with barley were the same as those for the fertilizer experiments previously reported. The average of the six reports of successfully conducted experiments for 1913, and of the twenty-eight reports of the experiments conducted in the past four years are here presented:—

Fertilizer.	Individual Fertilizer per Acre.	Total Fertilizer per Acre.		Yield per Acre.			
				Straw (tons.)		Grain (bus.)	
	Pounds.	Pounds.	Approximate Cost. $	1913.	Average 4 yrs.	1913.	Average 4 yrs.
1. Nothing	.....	.....	.....	1.10	1.21	41.33	29.64
2. Nitrate of Soda	100	100	3 00	1.39	1.35	47.18	33.73
3. Muriate of Potash	100	100	2 50	1.26	1.40	46.03	34.70
4. Superphosphate	200	200	2 45	1.26	1.42	43.13	34.37
5. Nitrate of Soda Muriate of Potash	100 100	200	5 50	1.37	1.45	51.75	37.37
6. Nitrate of Soda Superphosphate	100 200	300	5 45	1.38	1.41	49.12	37.66
7. Muriate of Potash Superphosphate	100 200	300	4 95	1.52	1.50	51.78	38.51
8. Nitrate of Soda Muriate of Potash Superphosphate	100 100 200	400	7 95	1.42	1.47	51.00	39.82
9. Lime	1,400	1,400	4 60	1.41	1.37	49.95	34.81
10. Cow Manure	40,000 (20 tons)	40,000 (20 tons)	6 00	1.49	1.55	46.77	39.08

There were six good full reports of carefully conducted experiments with fertilizers and barley in 1913. The yields per acre in 1913 were larger than the average yields in the experiment for the four-year period, during which time the test has been conducted throughout Ontario. It will be seen that the results from cow manure were rather lower in 1913 than in other years. This is probably owing to the fact that the land was plowed in the spring, and as the season was rather dry the manure no doubt had a tendency of keeping the land more open in the growing season. The average results show that the fertilizers and manure surpassed the unfertilized land in yield of barley from 4.1 bushels to 10.2 bushels per acre. The highest average yield per acre was produced by the complete fertilizer

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which was followed quite closely by the cow manure. According to the increases in the yield of barley per acre and the prices of the fertilizers given in the table it appears that the increase was made at the smallest cost by the use of muriate of potash at the rate of one hundred pounds per acre. This application caused an increase of slightly over five bushels of barley per acre and the cost of the fertilizer was $2.50, or an average cost of about 49c. for each bushel of increase. The greatest influence from the application of any fertilizer in experiments in barley in 1913 was made by the complete fertilizer on a clay loam in Grey County, in which case the increase of the fertilized as compared with the unfertilized land was 26.6 bushels per acre, which would cost at the rate of $7.95, or practically 30c. per bushel.

Nitrate of Soda and Common Salt with Mangels.

In each of five years a co-operative experiment was conducted throughout Ontario in testing different fertilizers with mangels. From this experiment it was found that an application of 160 pounds of nitrate of soda per acre, applied to the land when the mangels were about three inches in height, increased the yield of roots per acre six tons, according to the average results of the 41 separate tests conducted within the five-year period.

Fertilizers.				Average Yields of Mangels per acre (tons).	
When applied.	Kinds.	Quantity per acre.	Approximate cost per acre.	1913.	Average two years.
		Lbs.	$ c.		
When Plants are three inches tall..	1. Nothing.....	.....	.....	27.36	30.03
	2. Nitrate of Soda.	100	3 00	30.00	33.96
	3. " "	160	4 80	32.80	36.78
	4. " "	200	6 00	35.12	38.68
At the time Seed is sown	5. " "	100	3 00	29.48	34.25
	6. " "	160	4 80	30.28	35.64
	7. " "	200	6 00	32.56	37.54
	8. Common Salt..	200	.....	29.08	34.86
	9. " "	400	.....	29.56	33.44

In the spring of 1911 another experiment was started with fertilizers and mangels. For this experiment nitrate of soda was applied to the mangels at the rates of 100, 160, and 200 pounds per acre at the time of sowing the seed, and also on separate plots when the mangel plants were about three inches in height. In comparison with the six plots with nitrate of soda, common salt was applied at the rate of 200 and 400 pounds per acre at the time of sowing the mangel seed. Two plots were left unfertilized in each experiment. In 1911, the first year of this experiment, no really satisfactory results which could be used in a tabulated report were received. In 1912 four, and in 1913 two complete reports were obtained.

It will be remembered that in the former experiment which was conducted throughout Ontario for five years, and of which we obtained 41 good reports, the

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mangel crop was increased six tons per acre by an application of 160 pounds of nitrate of soda. In the results here presented it will be seen that 160 pounds of nitrate of soda applied when the plants were three inches tall increased the yield of mangels six and three-quarter tons per acre, and that the same quantity of nitrate of soda applied at the time that the seed was sown increased the yield of mangels 5.6 tons per acre. In that part of the second experiment which corresponds with the first experiment the results are, therefore, quite similar, viz., that an application of 160 pounds of nitrate of soda per acre is likely to increase the mangel crop about six tons per acre under average conditions of soil and climate in Ontario. The yield of mangels per acre has been increased or decreased according to the amount of nitrate of soda which has been applied. The highest average yield of roots per acre in the average of the past two years was produced from 200 pounds of nitrate of soda per acre applied when the plants were about three inches in height. This increase amounted to 8.65 tons at a cost of about $6.00 for the fertilizer, which amounts to 69c. per ton or a trifle over 2c. per bushel.

As the result of the co-operative experiments conducted throughout Ontario in each of seven years the application of nitrate of soda has been quite economical in the production of the mangel crop. Experiments with fertilizers and mangels will likely be continued throughout Ontario, and the results will become more valuable as the number of experiments increases.

Six-Plot Experiment with Fertilizers and Potatoes.

As a result of experiments conducted at the Ontario Agricultural College in each of five years it was found that the Royal Canadian and potato fertilizer gave the highest yield of potatoes per acre of the different fertilizers used in the five-year experiment. In another experiment, extending over a period of five years, in which several fertilizers were used, the highest yield per acre was obtained from a mixed fertilizer similar to the one used in our co-operative experiments, and which was composed of nitrate of soda, muriate of potash and superphosphate in the proportion by weight of 1, 1 and 2, and which was applied at the rate of 213 pounds per acre. This was followed by the Royal Canadian and the potato fertilizer, each of which was applied at the rate of 320 pounds per acre. Based on these and other results, a co-operative experiment was conducted in each of five years previous to 1912, in which six different fertilizers were compared with each other, with farmyard manure, and with no fertilizer with potatoes. The average results of this experiment conducted within the five-year period on 98 farms of Ontario were reported in 1911. The average results of the 98 experiments showed the yield of potatoes per acre to be as follows: Unfertilized land, 129.2 bushels; 160 pounds of nitrate of soda, 153.4 bushels; 160 pounds of muriate of potash, 160.8 bushels; 320 pounds of superphosphate, 156.8 bushels; 213 pounds of the complete fertilizer previously described, 166.8 bushels; 320 pounds potato fertilizer, 167.5 bushels; 320 pounds of Royal Canadian fertilizer, 164.5 bushels, and 20 tons of cow manure, 174.7 bushels. According to the prices given for the manure and the fertilizers in the report of 1911, the increased yield of potatoes was produced at a cost per bushel for the complete fertilizer of 11.3 cents; muriate of potash, 12.7 cents; cow manure, 13.2 cents.; superphosphate, 14.2 cents; potato fertilizer, 14.4 cents; Royal Canadian fertilizer, 15.9 cents, and nitrate of soda, 19.8 cents.

Based on the results of past experiments it was thought wise to start a co-operative experiment in testing different quantities of fertilizers per acre in com-

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parison with each other, with farmyard manure alone, with farmyard manure and fertilizer, and with unfertilized land. We therefore placed on our list an experiment with fertilizers, cow manure, and no fertilizer with potatoes, in the spring of 1912, and we conducted experiments in 120 places throughout the Province in each of the past two years. In each of these years we divided the number into four groups of thirty each, and used the Royal Canadian fertilizer for one group, the potato fertilizer for another, a fertilizer composed of nitrate of soda, muriate of potash, and superphosphate, in the proportion by weight of 7, 9, and 16, for another, and a fertilizer composed of nitrate of soda, muriate of potash and superphosphate, in the proportion of 1, 1 and 2 for the fourth group. Each of the first three fertilizers were applied alone at the rate of 320, 640, and 960 pounds per acre, and 320 pounds in combination with ten tons of cow manure per acre. In comparison with these, another plot received cow manure at the rate of twenty tons per acre, and one plot was left unfertilized. For No. 4 group the fertilizer was used in the same proportion, with the exception that the minimum amount was 213 instead of 320 pounds per acre. Owing to the unusual weather conditions in 1912 the potato rot was very prevalent and many of the results of the fertilizer experiments obtained could not be used on that account. There were, however, nineteen good reports of successfully conducted experiments with fertilizers and potatoes obtained in which the rot did not prove troublesome and which represented fairly well the four different kinds of fertilizers distributed. In 1913 we received in all thirty-one good reports, there being from six to ten good reports for each group. We therefore have for the two years fifty good reports of successfully conducted experiments. The folllowing table gives the average results of the thirty-seven reports of the successfully conducted experiments of the first three groups in the past two years, and also the average results of thirteen tests made in the last two years with fertilizers of group 4:—

Fertilizers and manure.	Quantity per acre. Pounds.	Yield of potatoes per acre (bus.)	
		Groups 1, 2 and 3. Average 2 years. 3 sets. 37 tests.	Group 4. Average 2 years. 13 tests.
1. No Fertilizer		125.5	127.4
2. Fertilizer	320	149.5	*151.4
3. Fertilizer	640	159.5	170.7
4. Fertilizer	960	173.6	183.1
5. Fertilzer	320	168.5	183.2
Cow manure	20,000 (10 tons)		
6. Cow manure	40,000 (20 tons)	171.3	181.8

The fertilizers used for groups 1, 2, and 3 were somewhat similar in composition, all being complete in character for obtaining nitrogen, potash and phosphoric

*213 instead of 320 pounds of fertilizers were used for this plot.

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acid. The results as here presented are those from general potato fertilizers used in different quantities and on what might be termed the average soil of Ontario, as the experiments were conducted on thirty-seven different farms. It will be seen that on the average there was an increase in the yield of potatoes per acre of 24 bushels from 320 pounds of fertilizer, 34 bushels from 640 pounds of fertilizer, and 48.1 bushels from 960 pounds of fertilizer. It will be seen that the yields of potatoes increased as the amount of fertilizer used became greater. From a study of these results it would seem as though the first 320 pounds of fertilizer increased the yield 24 bushels, the second 320 pounds 10 bushels, and the third 320 pounds 14.1 bushels per acre. It will also be observed that the twenty tons of cow manure per acre increased the yield of potatoes 45.8 bushels, or 2.8 bushels per acre more than a combination of ten tons of cow manure and 320 pounds of fertilizer per acre. The average results of the thirteen tests in group 4 are fairly similar to those of the other three groups already discussed. The amount of fertilizer for plot 2 in group 4 consisted of 213 instead of 320 pounds per acre, and it is identical with the complete fertilizer used for five years throughout Ontario in experiments conducted on ninety-eight farms, the results of which are presented in the first table in this report on fertilizers with farm crops. From a study of the individual results in the foregoing table the increases in yields of potatoes which were made at the lowest cost per acre in the average results for the two years were obtained from 320 pounds of the complete fertilizer as represented by groups 1, 2 and 3, and from 213 pounds of the fertilizer composed of nitrate of soda, muriate of potash, and superphosphate in the proportion by weight of 1, 1 and 2. It is the intention to repeat this experiment in exactly the same way for a number of years, and as more results are obtained they will become of increasing value and we will be in a position to present them in greater detail and also be able to draw lessons of even greater value.

SOME OF THE MOST IMPORTANT RESULTS THROUGHOUT ONTARIO FROM THE USE OF LEGUME BACTERIA WITH ALFALFA, CLOVER, ETC., IN 1913, AND IN THE AVERAGE OF NINE YEARS.

PROF. S. F. EDWARDS, O.A.C., GUELPH.

For the year just past, a total of 3,154 cultures of legume bacteria, each culture sufficient for one bushel of seed, were distributed for various seeds as follows:

Alfalfa, 2,446; Red Clover, 461; Alsike Clover, White Clover, peas, beans, vetches, sweet peas, soy bean, cow peas, 247.

The number of cultures sent shows a marked decrease from last year, the cause for which we attribute very largely to the difficulty which farmers encountered last season in securing alfalfa seed. The distribution of alfalfa cultures by Provinces is as follows:

Ontario, 1696, Alberta 131, British Columbia 240, Saskatchewan 168, other provinces and foreign countries 211. It is of interest to note in this connection that several cultures were sent to South Africa, Egypt, and to Formosa. The total number of farmers to whom cultures were sent was 1,493, of whom 1,267 received

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cultures for alfalfa. As heretofore, blank reports were sent to recipients of cultures asking for the results of their seed inoculation, and data compiled from the reports returned show the inoculation beneficial to the crop in 68.3 per cent. of cases.

SUMMARY OF RESULTS IN SEED INOCULATION, 1905-13.

Year.	Total Cultures Sent.	Total Reports Received.	Inoculation Beneficial.	Inoculation not Beneficial.	*Others.	Per Cent. Favorable.
1905	246	134	91	40	3	69.4
1906	375	144	72	48	24	60.0
1907	372	187	67	57	63	54.0
1908	2,113	699	397	237	65	62.6
1909	2,017	494	211	161	122	56.7
1910	3,375	771	344	179	248	65.7
1911	4,941	1,307	453	371	483	55.0
1912	4,772	885	412	141	332	74.0
1913	3,154	580	199	92	289	68.2

*In this column are included reports from farmers who sowed no uninoculated seed, or in which long continued drouth, excessive moisture, or some other condition injured or destroyed the seeding. These are not figured in the percentage column.

RESULTS OF INOCULATION OF ALFALFA IN ONTARIO.

Total cultures sent.	Reports— +	Reports— −	Per cent favorable.
1905			
1906	9	4	69.2
1907— 170	36	28	56.2
1908—1236	261	140	64.8
1909—1205	130	98	57.0
1910—2005	187	74	71.6
1911—3236			
1912—3450			
1913—1696	111	51	68.5

RESULTS OF CO-OPERATIVE EXPERIMENTS IN APICULTURE.

MORLEY PETTIT, PROVINCIAL APIARIST, GUELPH.

In carrying on experimental work by the co-operation of bee-keepers throughout the country, one is led to stop and ask what is actually being gained. As the methods recommended have been pretty well proven before being sent out, the work is more educational than experimental in the more strict sense of the word. To determine the extent of its educational value a general review has been made of reports and correspondence received from experimenters since 1910 seeking answers to the following questions. First, of those who received instructions for the experiment and sent no report, how many are showing progress in their business by increasing their apiaries? What reasons if any, have been given for not reporting, and what benefits have been derived from the work? Second, of those who

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reported on the experiment at the end of the year, how many are increasing their business and continuing co-operative experiments, and what other benefits are derived?

The co-operative experiments, inaugurated in 1910, have been principally devoted to methods of prevention of natural swarming; this being one of the greatest problems of modern bee-keeping.

In that year, there were twenty-five experimenters who sent full reports. Of these, sixteen reported on their apiaries in 1913. These sixteen had eight hundred and five colonies in 1910, and one thousand three hundred and seventeen colonies in 1913; an increase of 64 per cent. in their business. Two others of the twenty-five reported an increase of colonies in 1911, but have not reported since, and seven of the twenty-five have shown a decrease in the number of colonies since 1910; nine of them are members of the Ontario Bee-keepers' Association and twelve have applied for experiments since.

Perhaps the most interesting part of these results is the report of the benefits derived by the experimenters from their work: such as "practical experience," "labor saved," "more knowledge of bees, "more system," "better control of bees," "pleasure and education." After having made the test carefully according to directions, seventeen out of the twenty-five said they decidedly preferred the method described in the experiment, six thought their own method was just as good, if not better, two were not certain, and one would try it again.

Our records show that ninety-five of those who applied for the experiment and did not send complete reports have reported an increase of colonies since 1910; of these thirty-eight are members of the Ontario Bee-keepers' Association, twenty-two have applied for the experiment since and three have attended the Short Course in Apiculture at the Ontario Agricultural College.

The following are some of the reasons given for not experimenting: Thirteen reported pressure of other work, eight were discouraged by weather conditions, fifteen gave good reasons why the experiment could not be conducted, such as "sickness," "change of plans," "lack of proper appliances or of sufficient help." Five of these reported having received benefits from the instructions even though they were not fully carried out. Some of these were stated as follows: "The experiment was not a success in 1910, but used the method successfully in 1911," "Five colonies in Lot A gave 494 pounds though instructions were badly carried out, while Lot B gave 341 pounds, a difference of 153 pounds, making an average of $3.00 per colony in favor of the experiment.

To summarize the results of the co-operative experiments of 1910, the number of colonies of 36 per cent. of the experimenters has decreased in the three following years and 64 per cent. have had an increase in the number of colonies. From the letters 23 per cent. gave reasons for not experimenting, and from reports and letters 29 per cent. of the experimenters report benefits derived; forty-seven experimenters are members of the Ontario Bee-keepers' Association, and thirty-four have applied for experiments since 1910, three have attended the Short Course. These seem to indicate a gratifying interest on the part of the experimenters, in the experiments and in their business.

Co-operative Experiments for 1911.

In 1911, there were experiments on swarm prevention, also on races of bees, particularly with reference to their power to resist European Foul Brood.

Of eighteen complete reports on swarm prevention eleven show an increase in

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the number of colonies in the years 1912 and 1913, and seven show a decrease. Of twenty-one incomplete reports, ten show an increase in the number of colonies and eleven a decrease; 33 per cent. of these experimenters are members of the Ontario Bee-keepers' Association and 40 per cent. applied for experiments in other years.

The following are just a few quotations from letters and reports of experimenters: "Can prevent them from increasing so fast and get more honey." "Saves time, stimulates my own interest." "My own plan is good but yours is better." "This is more systematic." "Better knowledge of bee-keeping." "My method was similar to yours, but in 1910 I tried natural swarming and I am now satisfied that the method is better because you can depend on leaving your apiary for a week at a time, but when natural swarming is practised you cannot leave and attend to anything else." "You know what your colonies are like all the time." "Your method is the best I have tried yet." "I have used the system for some years very satisfactorily. Had only one swarm altogether from sixty-nine colonies and extracted 9,200 pounds of honey, an average of about 132 pounds per colony." "It has taught me that it pays to control swarming to get a good crop of honey." "More honey, less work." "I have learned to produce fancy comb honey and interest others in bee-keeping." "Good health and some money." "Confirms my previous opinions." "Learned how to handle bees." "Do not expect to lose any more swarms." "Found it pays to control swarming."

Of those who applied for experiments and sent no reports two hundred and twenty-five have allowed their colonies to decrease since 1911; and one hundred and thirty-six show an increase of colonies in the same time. Of these latter, 61 per cent. are members of the Ontario Bee-keepers' Association and 36 per cent. have applied for experiments in other years. Thirty-seven of these have written giving reasons for not reporting, such as: other work, sickness, absence from home, loss of bees and neglect. Two reported that the instructions were helpful.

The following are extracts from the letters of non-reporters: "I did not have very good luck catching swarms and I thought I would try all my bees the way your instructions stated and I like that way." "I got on well and am going to try it again as I caught all my bees and lost none in swarming." "Learned a lot from your instructions, got more honey and fewer swarms." "Could not follow the instructions fully, but what little attention we could give the plan it proved much better than the old way." "More honey." "Instructions were very beneficial as far as I was able to follow them." "Gave them new comb and two storey Langstroth hives. Examined them several times but they had no inclination to swarm."

The following is from a bee-keeper who had seventy-seven colonies in 1911: "The experiments are doing a good work. I am very grateful for the help you have given me." His honey crop was 142 pounds per colony.

It is hoped not only to help the larger bee-keepers, but also those with only one colony, of which the following is an example: This bee-keeper experimented with one colony for three successive years, and states his result as follows: "I have learned how to control swarming and produce fine comb honey." It is evident that no one need fear to undertake the experiment because of the fewness of his hives, if this bee-keeper with one colony can secure such results.

EXPERIMENTS ON RACES OF BEES: The following are reports received this year from queens sent out in 1911. Three reported that the queen was not received. One was a drone layer, another proved unsatisfactory and was destroyed this year, another "Her bees were lazy and I pinched her head off."

Reports from the Carniolan queens are as follows: "Queen did not resist the

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disease." "In 1912 the Carniolan had the best colony but died with European Foul Brood. The colony of the Italian queen resisted the European Foul Brood." "Carniolan queen built strong colony by fall." "Carniolan queen wintered well, but when the disease came in 1912, was not any better, if as good, as the blacks to resist it." "A great comb builder and a great honey gatherer." "Carniolan bees from this queen were my best honey gatherers; built up fast but when they swarm they attempt that which they know how to do on the whole better than the Italians." "In 1911 the Carniolan gave more honey and more increase than the Italian. In 1912 the Italians gave more honey and more increase than the Carniolans. I did not find my Carniolans excessive swarmers."

The results of this experiment seem to indicate that Carniolans are excellent for building up in the spring, gentle to handle, but usually swarm excessively, and that they do not resist European Foul Brood as well as the Italians. Some report saying that they are no better than the Blacks. There is a difference of opinion as to their honey gathering qualities, but the larger part of the evidence in the reports is in favor of the Italians.

ITALIANS AND DISEASE: "The colony to which the Italian queen was given produced 120 pounds of honey in 1912, and four swarms; no signs of European Foul Brood." "Bees resisted disease. Two swarms in 1912." "The three-banded Italian queen proved the best honey gatherer." "Raised thirty queens from her, all satisfactory." "Experimenting with several strains; it cannot be expected that any of them will fight off the disease in every case the first year." "I stacked three diseased brood nests on top of one weak Italian colony and left them there two weeks; then placed the top one of the three on the stand and shook all the bees into it leaving them on the diseased comb and they developed into a strong colony." "Average honey production. Best to resist disease of any in the yard. Reared daughters from her." "The colony to which the queen was given overcame European Foul Brood, but the disease was with the Black bees. Reared ten queens from her." "Queen was given to a colony which had been treated for European Foul Brood in 1911. In 1912 there was no disease, but it appeared in all stages in the colonies in 1913. The colony was left without further treatment and they cleaned house and gave two good swarms besides." "I consider one strain of Italians as good as another as far as resisting European Foul Brood is concerned, but I am certain that the three-banded Italians are far the best honey gatherers. I had twenty-five cases of disease out of sixty-five colonies spring count, and I got 115 pounds of clover honey and 30 pounds buckwheat honey per colony." One case where there was a crop in spite of European Foul Brood where Italians were used. "Fifty pounds of honey and one swarm in 1912. European Foul Brood was with the Black bees, but none with the Italians."

OTHER REPORTS: "Second best stock in yard. Raised one swarm from the stock which is first class." "The hive which had the queen you sent me yielded me this year 80 pounds extracted honey and four hives of young bees. The first hive has given over 100 pounds of comb honey and cast a swarm which went to the woods. The second hive is full of honey and I took a case of twenty-eight sections yesterday. The third hive is full of honey and has a case of combs full to extract. The fourth hive is full of honey and has a super on top but have not examined it yet. You can make up what the one swarm was worth in the spring. These four young swarms all came out in June. I would not take $25 for them now."

The results of the experiments on the race of bees have been very practical. The fact that 61 per cent. of those experimenting who have increased their

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number of colonies since 1911 are members of the Ontario Bee-keepers' Association, and also that 36 per cent. of them made application for experiments in other years, would indicate that these experiments are proving helpful to those who are the most interested in their bees.

Co-operative Experiments for 1912.

In 1912, the following experiments were sent out:

No. 1. Prevention of Natural Swarming in Extracted Honey Production by Holding the Colony Together.

No. 2. Prevention of Natural Swarming in Comb Honey Production by Artificial Shaken Swarming.

No. 3. Prevention of Natural Swarming by the Manipulation of Hives.

Special Experiments: Races of Bees, General and with Reference to European Foul Brood.

Two hundred and twenty applications were received for experiment No. 1, sixty-eight for No. 2, ninety-three for No. 3, sixteen for the special experiments, making three hundred and ninety-seven applications in all. When the reports came in there were seventeen complete reports on No. 1, and fourteen incomplete reports, which gave us valuable information. Six reports were received on experiment No. 2, and twelve on experiment No. 3.

Results of Experiment No. 1: Of the two hundred and twenty persons who undertook this experiment, thirty-one sent reports from eighteen different counties. These reported a total of eight hundred and thirty colonies of bees in the spring and one thousand one hundred and nine in the fall, being a spring average of twenty-seven colonies per experimenter and a fall average of thirty-six; an average increase of 33.6 per cent. The total honey crop was sixty-three thousand two hundred and thirty pounds, an average of 76.1 pounds per colony, spring count.

Those who sent incomplete reports all gave good reasons for not completing the experiment. One experimenter with ninety-four colonies stated that he used regularly the same method as that described in the experiment so could not make any comparison. Two other experimenters gave the same reason. Others stated that they had a poor season, or were too busy with other things. Several of them however, stated that they had derived good benefits, such as "better ideas," "good returns" and the like from having conducted the experiment as far as they did, and hoped that they might have the opportunity of testing it more fully next year.

Of the seventeen experimenters who sent complete reports, the per cent. of natural swarms in Lot A managed according to directions, was a little less than in 1911, being 21.3 per cent. in 1912, and 24 per cent. in 1911. The per cent. of natural swarms in Lot B managed according to the bee-keeper's method was 48. The average pounds of honey per colony from Lot A was 76.59 pounds, being a little better than the average for all the colonies managed by the experimenters. The average for Lot B was 57.51 pounds, showing a gain of 19 pounds per colony in favor of the management according to directions in the experiment.

Six experimenters stated that they could see no difference in the condition of the colonies in Lot A and Lot B in the fall. Seven experimenters reported that the colonies in Lot A were in much better condition in the fall, being "stronger," "more young bees" and "better generally." One experimenter found that during the season the loss by the old method was so great that he changed his management from Lot B and managed them all according to directions. The difficulties experienced were "poor season," "lack of help," "lack of time," and in one or two

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cases by older men a preference for the old method of natural swarming. The benefits derived were "a larger honey crop," "better knowledge of the bees," etc.

Experiment No. 2.—Six complete reports of this experiment were sent from five different counties. The total number of colonies represented was one hundred and sixty-one, spring count, and two hundred and twenty-eight, fall count, being an increase of 41.6 per cent. The total honey crop was eight thousand four hundred and forty-nine pounds, an average of 52.47 pounds per colony, spring count.

The per cent. of natural swarms from Lot A, was 57, from Lot B, 100 per cent. The average crop from Lot A was 47.25 pounds per colony and from Lot B, 39.50 pounds. It will be seen that both the averages are less than the average crop from the total number of colonies kept. This can doubtless be accounted for by the fact that bee-keepers who have allowed their bees to manage themselves sometimes make mistakes when starting the manipulation of combs and do more harm than good on the start. Benefits derived were "increased knowledge," "increase of honey crop," "whiter honey," and "swarm prevention."

Experiment No. 3.—Twelve experimenters sent complete reports from five different counties. The total number of colonies owned by experimenters in the spring was five hundred and fifteen, and in the fall, seven hundred and forty-three, being an increase of 44.27 per cent. The total honey crop reported was 25,363 lbs., an average per colony of 49.24 pounds. The groups of hives used for this experiment averaged fourteen hives each. The groups were divided into Lot A, consisting of seven hives managed according to directions, and Lot B, seven hives managed the way the bee-keeper always managed his colonies. The per cent. of natural swarms from Lot A was 14.63, from Lot B, 39.02. The average number of pounds of honey per colony from Lot A was 47.9, from Lot B, 45.07. Three experimenters reported that the two lots were about equal in the fall. Three other experimenters reported that Lot A was in better condition than Lot B, and three others reported that Lot B was the better of the two. One experimenter reported that he always uses the method described. Another used the method on a large number of colonies and is thoroughly convinced of its value. One man put his supers on too early, another did not put the brood up according to directions, and another had a very poor season. Another stated that Lot B was in better condition because he "did not bother them so much." Benefits derived are "increased interest," "saving of time," "far more honey," and that "this is an easier method than Experiment No. 1."

Of the thirty-five complete reports received on the three experiments, twenty-seven experimenters show an increase in the number of colonies from the spring of 1912 to the fall of 1913, and eight show a decrease. Twenty-four of the thirty-five are members of the Ontario Bee-keepers' Association and nineteen have applied for experiments in other years.

Of the fourteen who sent incomplete reports, thirteen show an increase in the number of colonies from the spring of 1912 to the fall of 1913, and one a decrease: nine are members of the Ontario Bee-keepers' Association, and seven have applied for experiments in other years.

Letters and reports give the following personal testimonials: "With a good year the experiment would work to perfection." "Tried it on six strong colonies and got about 185 pounds each." "Found my own plan which I have used for two years better: to take all the brood away when they show signs of swarming, giving comb to queen and putting brood on top of supers." Eight experimenters

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reported "more honey." "A good deal of enjoyment and some profit." "I have learned more about bees." "A better idea of swarming." "Showed me that I need to study some for another year's work." "Learned the necessity of giving plenty of room and ventilation." "An interesting time among the bees."

Eighty-one of those who applied for the experiment have not let us hear from them in any way since the spring of 1912. Seventy-seven others show a decrease in the number of colonies and one hundred and fifty-seven report an increase; of these 67 per cent. are members of the Ontario Bee-keepers' Association and 41 per cent. have applied for experiments in other years. Fourteen of the experimenters for the year 1912 have attended the Short Course in Apiculture at this College. One experimenter stated that he had followed the experiment during 1911, but had simplified the method for 1912. He states, "I am glad to get your pamphlets and to read your suggestions as these have been helpful to me in swarm control. A young queen in each colony, raised from a mother that does not swarm, helps to keep down swarming. I am quite sure swarming is encouraged by having queens raised under the swarming impulse."

SPECIAL EXPERIMENTS ON RACES OF BEES: There were two special experiments sent out in 1911 on which we have received reports. One was a comparison of Carniolan queens with Italian queens and the other was a test of certain Italian queens as to the power of their bees to resist European Foul Brood. The report on the Carniolan queens was almost universally the same. Their bees wintered well and built up well in the spring, but contracted swarming impulse so early in the season that the experimenters were unable to hold the colonies together and secure a crop of honey from them. In most cases they superseded early in the season. One experimenter stated, however, that by giving an extra large brood-chamber space he was able to hold the colony together and secure a large crop of honey. He believes that with proper management with large hives they would give large yields of honey. There is no doubt that the Carniolans require different management and different hives from Italians, but their similarity in appearance to the Blacks, which are an inferior race, makes it very questionable as to the wisdom of adopting Carniolan bees generally in this country.

There is no longer any doubt as to the power of Italians to resist European Foul Brood. We are still unable to recommend any special strains of these as being better than others in this respect. The verdict from some of our most successful bee-keepers seems to be that the brighter the yellow color the better their resisting power. One bee-keeper in particular, who is the greatest authority on European Foul Brood in Ontario, states that as long as he keeps his bees bright yellow he has no trouble, but as soon as any colonies turn darker he finds the disease cropping out; but he is able to check it immediately by introducing a queen of the yellow strain again. Others again claim that the three-banded Italians are quite as good disease resisters and are more valuable in other respects than the Goldens.

SPECIAL EXPERIMENT WITH CARNIOLANS: Queens from four breeders of Carniolans were sent to these experimenters in July, 1911, with the following simple instructions: "To give this queen a fair test, you will need to get her established in a colony of her own this season, either by making a nucleus, or by requeening a full colony. Please give this colony the best chance you can for wintering, and compare results with another colony of equal strength, age of queen, etc., next season."

The following are some personal reports from experimenters:

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"Both colonies wintered perfectly; the Carniolans built up more rapidly in the spring. I raised the brood chamber in both leaving queen below the excluder. The Italians (Moore strain) accepted the conditions and stored rapidly; the others swarmed, and swarmed out again. The last time, when I was at school, to my regret the queen disappeared. The colony did not store much as a result, about 50 lbs., and the Italians 100 lbs. I know now I should have handled the colony differently. The Carniolans were gentle to handle.—Haldimand County."

"The two hives were set side by side in the cellar and both came out good and strong on the 12th day of April. On the 6th of May the Carniolans had six frames with brood, and built up faster than the other. On the 22nd of June she superseded. The Italians did not swarm, and I took 110 pounds of white honey from it. The Carniolan increased to two hives of bees and 35 pounds of white honey.—Victoria County."

"I could not find that they were any better honey gatherers or that they built up any faster than Italians of equal strength. They did not swarm but they were run for extracted honey; they were not extra strong in the spring and did not get more than 80 lbs. of honey. Our average was 122 lbs. per colony.—Lambton County."

"The Carniolan queen was very good but a great swarmer, a great comb-builder and a great honey-gatherer. First as a swarmer it was impossible to keep her colony in a ten frame hive, and when it did swarm it was impossible to keep it in a new ten frame hive, for it swarmed out every day for three days. When I gave it two hives or a double storey then it stayed for a while. Second as a comb builder it built twenty combs in six days, wonderful work, beautiful and white to look at. Third as a honey gatherer I never saw the equal of her bees, for in six days they had twenty combs filled with beautiful white honey. To compare her with any queen in the yard of the same age she has them 'beat all hollow'; only for that awful swarming.—Peel County."

"Compared Carniolan colony with black bees and they beat the whole lot of them, very favorable opinion of Carniolan bees, never tried any other kind but the blacks.—Dundas County."

"The Carniolans swarmed first in my yard of 27 colonies. In the fall they all had plenty of stores and the Italians had to be fed. The Italians did not swarm until the last of clover so the Carniolans built the most comb. They seem to have a knack of looking out for themselves. I enjoyed the work very much.—Wentworth County."

"In the early spring the Carniolan colony was one of the strongest in the yard. On May 23rd, selected an Italian colony of about equal strength. Both were in 12 frame Langstroth hives, 9 frames containing brood. Managed both according to Experiment No. 3. Italians did not swarm at all, so at the end of the season I had two good colonies, one artificial, and about 90 lbs. of honey. The Carniolans superseded early in the season and swarmed twice naturally, so that with the one artificial swarm, I have four of them now; all are in very good condition but I only got about 60 lbs. surplus from the lot. In conclusion my experience coincides with the teaching of the text-book. The Carniolans are excellent to build up in the spring and gentle to handle but swarm excessively and also I think the queens are more shy and harder to find than the Italians.—Simcoe County."

Races of Bees Resistant to European Foul Brood: Although Italians are generally credited with being the best resisters of European Foul Brood a few leading United States bee-keepers prefer Carniolans. Only two reports have come

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to us from Ontario bee-keepers on this. These of course cannot be taken as conclusive. They are as follows:—

"The Carniolan queen was received in the fall. Next June 15th European Foul Brood was seen and on June 20th I could plainly see that she was going to let it spread and increase . . . Carniolans are not any better than the Blacks to resist Foul Brood.—Russell County."

The other stated that a little disease appeared late in the summer.

The reports on Italians are almost unanimous in crediting them with being practically immune to European Foul Brood.

Some of the most interesting of these will be given almost in full, as follows:—

"The Italian queen you had sent to me was received in fine shape, and put into a medium strong colony. I examined them at least ten times and no signs of European Foul Brood, and I have five colonies from that queen.—Prince Edward County.

"Our queen was introduced on June 13th to two colonies which had been united and treated for European Foul Brood. On June 21st we found Foul Brood again, but a month later and also when we put them in the cellar, we could find no trace of the disease. The colony was very strong in the fall and came out on April 20th, 1912, in fine shape. In 1912 we found several cells diseased but they disappeared a week or two afterwards. We made a nucleus and have found no foul brood in it yet.—Northumberland County."

One of the best reports comes from an old bee-keeper in Northumberland County, Ontario. In 1911 we sent him an untested Italian queen. He reports as follows:—

"I have handled bees for seventy years, and like to see the little servants work, but I have learned more about bees in the past year than all I have learned in all the years I have kept bees. They have always paid me very well but I knew very little of what their ability was to make money until you proposed to let me experiment in regard to the mastering of European Foul Brood. I had plenty of European Foul Brood, but I have none now, my hives are clean. I put the queen in a hive which had foul brood, and within two weeks after she began to send out her brood there was no trace of foul brood. She filled the hive with healthy brood. This was in 1911.

"The hive which had the queen you sent me yielded me in 1912, 80 pounds of extracted honey and four hives of young bees. The first hive has given over 100 pounds of comb honey, and cast a swarm which went to the woods. The second hive is full of honey and I took a case of 28 sections yesterday. The third hive is full of honey and has a case of combs full to extract. The fourth hive is full of honey and has a super on top but I did not examine it yet. You can make out what the one swarm was worth to me in the spring. These four young swarms all came out in June. I would not take $20 for them now." He further states that his Italian bees of the Robey strain have completely mastered European Foul Brood, although it was very bad in every one of his black colonies before he introduced them.

There is no doubt that the bee-keeper with good Italian bees has nothing much to fear from European Foul Brood.

SUMMARY: Of those who applied for experiments in the years 1910-11-12, about one-half show a decrease in the number of colonies; 1911 showing the greatest loss, the other half an increase. Of those showing an increase in the number of colonies, 54 per cent. are members of the Ontario Bee-keepers' Assoc-

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EXPERIMENTS, 1913—COMPLETE REPORTS

Counties	Number of Reports	Colonies		% Increase	Honey in pounds	Average per Colony spring count	No. Colonies Exp. Group Div. Equally	Natural swarms		Artificial increase		Av. lbs. honey per colony		Better lot in fall	Difficulties	Benefits
		Spring	Fall					Lot A	Lot B	Lot A	Lot B	Lot A	Lot B			
EXPERIMENT No. 1																
Huron	2	31	64	106.4	1,360	43.87	24	....	9	11	2	95.00	59.16	Equal	Time	Found better method.
Welland	2	23	40	73.9	2,300	100.00	6	3	2	1	1	130.00	140.67	Equal	Inexperience	Learned much.
Perth	1	9	17	88.8	1,300	144.44	9	....	3	2	3	150.00	100.00	Equal	.....	More honey, less work.
Simcoe	1	4	8	100.0	380	95.00	4	2	2	....	....	63.00	122.00	Lot "A"	Inexperience	Pleasure and increased revenue.
Wentworth	1	3	10	233.3	340	113.33	3	1	1	4	....	127.50	85.00	.....	.....	Found better way.
Ontario	1	2	6	200.0	385	192.50	5	....	....	....	....	70.00	117.50	.....	Foul brood	
Totals	8	72	145	101.4	6,065	84.24	51	6	17	18	6	105.62	87.16			
EXPERIMENT No. 2.																
Renfrew	1	28	30	7.1	3,000	107.14	16	....	....	....	....	100.00	125.00	Equal	Dry weather	
N.B.	1	6	14	133.3	200	33.33	6	1	5	2	....	53.33	14.60	Lot "A"	.....	Very great.
Totals	2	34	44	29.4	3,200	94.12	22	1	5	2	....	87.27	94.91			
EXPERIMENT No. 3																
Lennox	1	140	170	21.4	11,900	85.00	10	1	....	....	....	70.00	75.00	Equal	.....	
Bruce	1	25	50	100.0	3,600	144.00	12	3	3	....	....	108.33	80.00	Equal	.....	Many.
Huron	1	23	33	43.5	4,300	186.95	23	2	2	....	6	200.00	161.54	.....	.....	Know condition of bees.
Renfrew	1	18	29	61.1	1,400	77.77	10	....	1	4	4	98.00	100.00	Equal	.....	Better knowledge of bees.
Hastings	1	15	17	13.3	1,350	90.00	14	....	2	....	....	100.00	92.85	.....	.....	
Wellington	1	12	24	100.0	450	37.50	12	....	....	4	8	50.00	16.67	Equal	.....	

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Frontenac	1	5	10	100.0	200	40.00	5	2	1	....	2	21.00	42.25	Lot "B"	Not enough bees	Knowledge of swarming.
Welland	1	5	6	20.0	690	138.00	4	....	1	....	....	147.00	102.50	Equal	.....	Learned a good deal.
Totals.....	8	243	339	39.5	28,890	98.31	90	8	10	8	20	121.04	96.44			
EXPERIMENT No. 4.																
Peel	1	110	125	13.6	9,000	81.81	20	....	....	....	....	144.00	94.00	Equal	.....	Will feed whole yard next year.
Lincoln	1	86	140	62.8	7,100	82.55	10	4	4	....	....	68.00	92.00	Equal	.....	None this season.
Victoria	1	85	90	5.9	4,700	54.65	10	....	....	2	....	98.00	86.00	Lot "A"	.....	More honey, more work,
Wellington ...	1	38	40	5.2	3,050	80.26	10	....	....	....	....	74.00	66.00	Equal	.....	Knowledge of bees.
Prescott.....	1	34	35	2.9	1,000	29.41	8	....	2	....	....	40.00	17.50	Lot "A"	.....	Handling bees in better way.
Elgin.....	1	26	36	38.5	2,000	76.92	10	6	4	....	....	68.00	62.00	Equal	.....	Better knowledge of bees.
Lennox.....	1	26	26	.....	500	19.23	26	....	....	....	....	19.23	19.23	Equal	No rain	Very little.
Grey	1	10	16	60.0	1,070	107.00	8	2	3	....	....	137.50	100.00	Lot "A"	.....	More honey.
Haldimand ...	1	8	15	87.5	700	87.50	8	....	....	4	3	100.00	75.00	Equal	.....	
Huron.....	1	4	7	75.0	330	82.50	2	....	....	2	1	180.00	150.00	Lot "A"	Not enough bees	
Totals.....	10	427	530	24.1	29,450	68.97	112	12	13	8	4	80.71	65.00			

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iation, and 36 per cent. have applied for experiments in other years. This shows that sufficient benefits are being derived to maintain a continued interest in bee-keeping on the part of half the experimenters to the extent of keeping them in the Bee-keepers' Association and keeping 36 per cent. amongst the active experimenters.

Co-operative Experiments for 1913.

In 1913, there were four regular experiments and one special experiment on Races of Bees. The four experiments were as follows:

1. Prevention of Natural Swarming by Holding the Colony Together.
2. Prevention of Natural Swarming in Comb Honey Production.
3. Prevention of Natural Swarming in Extracted Honey Production by the Manipulation of Hives instead of Combs.
4. Spring Management.

For Experiment No. 1, sixty applications were received, and in the fall eight sent complete reports and twelve sent incomplete reports. The eight experimenters who sent complete reports have a total of seventy-two colonies spring count, and one hundred and forty-five colonies fall count, being an average increase of 101.4 per cent. The total honey crop was six thousand and sixty-five pounds, being an average per colony of 84.24. Per cent. of swarming from colonies of Lot A managed according to instructions was 23.5 per cent., and from colonies of Lot B, 66.6 per cent. The average honey crop per colony was 105.6 pounds per colony from Lot A, and 87.16 pounds per colony from Lot B. This shows very satisfactory results in reduction of swarming and increasing of the honey crop. The benefits stated by experimenters were quite as strongly expressed as usual.

Experiment No. 2. Twenty-three applications, two complete reports and six incomplete:

Two complete reports were received on this experiment; the experimenters reporting thirty-four colonies in the spring and forty-four in the fall, an increase of 29.4 per cent. The honey crop was three thousand two hundred pounds, an average of 94.12 pounds per colony. Lot A gave an average crop of 87.27 pounds and Lot B, 94.91 pounds per colony. Lot A cast 9 per cent. of swarms and Lot B cast 46 per cent. of swarms.

Experiment No. 3. Forty-nine applications received, eight complete reports and five incomplete:

There were eight complete reports on this experiment; the experimenters reporting two hundred and forty-three colonies spring count and three hundred and thirty-nine colonies fall count, an increase of 39.5 per cent. The honey crop was twenty-three thousand eight hundred and ninety pounds, an average of 98.31 pounds per colony.

The average experimental group consisted of eleven colonies, divided equally into Lot A managed according to directions, and Lot B managed by the bee-keeper's usual method of management. The per cent. of swarming from Lot A was 18 per cent. and from Lot B, 22 per cent. The average honey crop from Lot A was one hundred and twenty-one pounds per colony, and from Lot B, ninety-six and one-half pounds per colony.

Experiment No. 4: *Spring Management of Bees.*—The directions for this experiment consisted of instructions for spring stimulative feeding, whereby colonies get breeding up all through the spring so as to have the greatest number of workers in time for the honey flow.

Ninety-six bee-keepers made application for this experiment, ten sent complete reports and twelve sent incomplete reports. The ten who sent complete reports

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from ten different counties, had four hundred and twenty-seven colonies in the spring and five hundred and thirty colonies in the fall, an increase of 24 per cent. Their honey crop was twenty-nine thousand four hundred and fifty pounds, being an average of 68.97 pounds per colony.

From the experimental group, the average return was 80.71 pounds per colony from Lot A, which had been fed stimulatively during the spring and 65 pounds from Lot B, which had been managed according to the bee-keeper's usual method. In the fall six experimenters stated that the colonies of both lots were equal in strength. Four experimenters said that the colonies of Lot A were better than Lot B.

Summary for 1913.

Of those who sent complete reports, 4 per cent. indicate a decrease in the number of colonies from the reports of previous years, and 96 per cent. show an increase. Sixty-five per cent. of those showing an increase are members of the Ontario Bee-keepers' Association, and 50 per cent. of these have applied for experiments in other years. Of those who sent incomplete reports, 25 per cent. indicate a decrease in the number of colonies from the reports of previous years and 75 per cent. show an increase. Ninety-one per cent. of those showing an increase are members of the Ontario Bee-keepers' Association, and 54 per cent. have applied for experiments in other years.

Of those who applied for Experiments 1 to 4 and failed to report on the experiment in 1913, we have only one report of any kind from 14 per cent.; but 21 per cent. show a decrease in the number of colonies from the previous reports and 65 per cent. show an increase. Of those showing an increase 83 per cent. are members of the Ontario Bee-keepers' Association and 49 per cent. have applied for experiments in other years.

These figures seem to indicate that the experiments are conducted by those who are interested in bee-keeping as a business and also interested in the experiments as such.

Conclusions.

In 1913 four experiments on swarming and spring management were sent to two hundred and twenty-eight experimenters. These sent twenty-eight complete reports and thirty-five incomplete reports. Many others are being helped by the information given them. The sixty-three experimenters who reported had two thousand two hundred and five colonies spring count, and two thousand eight hundred and eighty-eight fall count, being a spring average of thirty-five colonies and a fall average of forty-six. Their total crop of honey was 205,416 pounds, an average per colony spring count, of 93.16 pounds per colony. In experimental groups managed for swarm prevention, there were eighty-one colonies, compared with eighty-one managed in the usual way. The former cast 18.4 per cent. of natural swarms and the latter 39 per cent., showing a decided gain in swarm prevention by the methods recommended by the Experimental Union.

RESULTS OF CO-OPERATIVE WORK IN FORESTRY IN ONTARIO.

Prof. E. J. Zavitz, Forestry Branch, Toronto.

This last season the Forestry Department distributed some 200,000 forest tree seedlings and transplants to private owners throughout the Province. These plants went into twenty-nine counties. The distribution of trees for this last season has

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been, as far as numbers are concerned, smaller than that of previous years. This is partly accounted for by the evident lack of labor throughout the Province. A number of applicants were unable to handle the work and notified us that they were afraid that they would not be able to carry out the experiment owing to lack of labor.

At the present time, we have experimental plantations in practically every county in the Province. These plantations vary in size from one-eighth of an acre to ten acres, and in a few cases even larger.

During the first five years of the life of the plantation it does not make very much of a show, as the plants are very small, when sent out from our nurseries. As the plantation gets up to the sixth year it begins to draw attention, and I anticipate that the influence of these experimental plantations throughout older Ontario will have a strong educational value.

The bulk of our plantations are made upon soils more or less unfit for agriculture. The plantations are made on steep hillsides, sand formations and upon blow sands, interfering often with township roads. This last form of planting on sand which is drifting across county or township roads is an interesting feature of our work.

There are a great number of places in the Province where light sand ridges intercept the highway. In many places where this sand has started to shift it is interfering with the condition of the roads. Scotch Pine and Jack Pine thrive in the very poorest sand, and it is a comparatively simple matter to form plantations upon these light soils.

In our circular we have advocated the planting of waste portions of woodlots and the introduction of evergreens into the composition of the woodlot, but this form of planting seems to have appealed to very few.

The improvement in the condition of the Ontario woodlot is a most difficult problem. When we realize the difficulty in interesting the landowners in improving methods relating to annual crops from which he derives his livelihood, it can be readily understood that the woodlot, which only gives small returns, with the long time element as a large factor, we can realize that it will be difficult to secure radical improvements. Here and there we find men prepared to protect their woodlands and improve them for the good of the future.

There is probably little change during the last five years in the percentage of woodlots in the Province, but there is certainly a gradual change for the worse in the quality of the woodlot. The better classes of trees are gradually being taken out and little attention is being paid to the future results of the cutting.

We are receiving splendid assistance from a number of the district representatives throughout the Province, and in counties where these men are taking some interest in this matter, there is a noticeable increase in the number of plantations asked for. I anticipate that the District Representatives will aid very much in the solution of this problem, as in many others.

At the Forest Station, in Norfolk County, our nurseries are being improved and better organized, and we will be able to meet the demand for forest nursery stock on a large scale in the future.

Mr. F. S. Newman, B.F.. has been appointed assistant to the Forestry Branch, and will have direct charge of this work.

At the present time, there are about one million plants in our nurseries and about 500,000 of these are ready for distribution this coming season.

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In last year's planting, at this station, we used about 200,000 plants. The older plantations at this station are proving very satisfactory and encouraging. In addition to the experimental value to these plantations, I feel that there is a local influence, which is quite noticeable. Our plantations on the blow-sands, which at first were more or less ridiculed, have proven successful, and now a number of local people throughout the county are taking advantage of the distribution of trees and making plantations upon similar situations.

I believe that with the solution of the labor problem and the general improvement which is coming throughout older Ontario, there will be a healthier interest taken in the reclamation and reforesting of poorer soils of the farm.

REPORT OF THE SCHOOLS' DIVISION OF THE EXPERIMENTAL UNION.

PROF. S. B. McCREADY, O.A. COLLEGE, GUELPH.
(Director of Elementary Agricultural Education.)

ORIGIN AND AIMS OF THE SCHOOLS' DIVISION.

The Schools' Division of the Experimental Union has completed the fifth year of its existence. It was organized in 1909. A word regarding its origin might be of interest. On assuming charge of the Nature Study Department in 1905, one of our earliest duties was to investigate the needs and plans for school gardening in Ontario and to publish a bulletin on the subject. Our inquiries led us to the conclusion that the best scheme to promote the work would be to have the country schools join in the work of the Experimental Union as carried on under the direction of Professor C. A. Zavitz. Here was an organization already successfully operating, and the work of which is nothing more or less than school gardening for grown-ups. Union with it would bring practical help and the advantages of many years' experience. Accordingly, Bulletin No. 152 *Gardening for Schools* was issued by the Department of Agriculture in 1906, showing teachers how to co-operate with the Experimental Union and how to encourage pupils to undertake experiments. There was only a very limited response. Neither the times nor the teachers were ready—or, what is also a large part of the explanation, the bulletin was very little read.

The next feature of the development was a seed distribution to schools and pupils carried on by Professor Hutt in his branch of the Union work during 1907 and 1908. Seed of different varieties of beet, carrots, onions and lettuce were sent out with instruction sheets telling how the work was to be carried on. Hundreds of experimenters joined in this work.

In order to better adjust the work of the Union to the limitations of teachers and pupils and also to make it of more direct use in the education of the child through the daily work of the school, the Schools' Division was organized in 1909. From the commencement the educational side of the work has been emphasized. The chief aim is not to grow grains, vegetables or flowers for the sake of getting crops of grains, vegetables or flowers, so much as to create in children wholesome, educative, natural interests and activities through which they may be educated

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into happy and useful citizenship. As in all educational endeavor, the teacher is the chief factor, and accordingly the work has been planned to enlist his or her intelligent co-operation. The putting of the seed into the hands of the child is not the end of the undertaking; it is only the beginning of it. It is to direct, to encourage, to enter into all the child's experiences and problems and to make use of these in the every day schooling of the pupil, realizing that the thing which a child actually performs himself is the sure foundation on which to base instruction. The production of good flowers and good vegetables and good grains, the introduction of improved varieties into the school-section, the awakening of an enlightened interest amongst the school patrons in the modern way to teach agriculture, the beautifying of the school and the school grounds, the better support of the teacher—all these things are sought in the work of the Schools' Division, but the one chief purpose is—using the educational agency organized for rural education, viz., the rural school—to help in securing a better education for our country boys and girls —a consummation devoutly to be wished.

The Schools' Division and the Rural Problem.

The Schools' Division claims place too as an agency in meeting the so-called "rural problem."

This problem has many sides to it, and it has been variously described or defined. One commonly accepted statement of it is: "To keep in the country a fair proportion of the population composed of contented, prosperous, intelligent, progressive, land-owning husbandmen." Another defines it: "To make country life so satisfying that a standard people will be retained for the country places of Canada."

We suppose the entire Experimental Union must be considered as an agency in the problem—not by any means, as often supposed, a new problem. The very existence of the Union proves that there is and long has been a problem. Through its different branches it seeks to secure for farmers better crops, larger crops, better methods of treating the soil, better uses of waste portions of the farms, and so more intelligent and more satisfied labor.

It is a rather peculiar thing that the school as a factor in the rural problem is commonly overlooked by those who promote agricultural welfare. I sometimes think that if about one-tenth of the energy and expense and public enterprise that is shown for the grown-ups in experimental unions, agricultural bulletins and reports (to say nothing of the agricultural press), agricultural societies, horticultural societies, fruit growers' association, beekeepers' association, grain growers' association, horse, cattle, sheep, swine and poultry associations, short courses, demonstration trains, farmers' institutes, and what-not, were directed towards the little fellow who is not yet grown up but who is still at school—that there would be good hope of a satisfactory solution of the problem. But apparently the boy is so small, and the school so insignificant—and the schoolmaster too!—that they are overlooked! In the larger task of redeeming the old fellow, the people lose sight of the wisdom of shutting off the supply of old fellows that need redemption. I venture to say that as time goes on there will be more and more conviction that most of the problems of agriculture and of rural life must find their solution in the common schools of the people.

By helping to rationalize the every-day work of the rural schools the Schools'

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Division hopes—and has some reason for hoping—to help in creating sympathetic and constructive sentiments on behalf of the country school, the country school teacher and the country boys' and girls' education.

The Weaknesses of the Rural Schools.

While some may fail to recognize the possibilities of the rural school in rural betterment, there are others who will say that the country school is at the bottom of the whole rural problem. They charge it with many faults and many deficiencies. They say it is expensive; that it isn't as good as it used to be; that the teachers are too highly paid and are not as good as they formerly were; that it is loaded with useless studies; that it educates boys off the farm; that it doesn't educate some of them at all; that it doesn't adapt its work and services to the changed needs of its clientele. Undoubtedly the school and our schemes of education here in Ontario as everywhere have some share in the cause of the social unrest in the country that has led to an overbalanced drift from country to town. But to charge all the blame to the rural school is unfair. Our rural schools are just as we make them ourselves. They only reflect the general attitude of their patrons towards education. Just as people will always have as good government as they really want and no better, so will every community have just as good a school as it really wants and no better.

All over the Province there are schools of the very best kind, doing the best kind of work (or at any rate the kind that the people desire), intelligently and liberally supported by the people who are served by them. If the schools are not giving the children what may be considered an education better suited to country life, it is because the people either have not asked for such because they do not realize that there may be such a kind of education, or they have refused to have such an education for their children, because they still worship the old fetish of examinations and look upon the school and school work as things fixed and inviolate—things, unlike everything else in human affairs, without progressive development. Our schools are adapting their work to meet changed conditions just as fast as people are asking for it—and in hundreds of cases there are teachers anxious to make a commencement in a better kind of instruction but restrained by an over-conservative, opposed-to-any-sort-of-change clientele.

In our democratic system of government the people can have any good reasonable thing that they want. Our schools as they are to be found simply represent what the people have wanted or been satisfied with. Nobody in particular can be blamed if we have not better schools or a better kind of school. Certainly there has never been lack of effort to make them better. For example, we have been trying since 1847—for 66 years—to have agriculture taught in our schools and we're not so very far further on than we were then. Educational progress must necessarily be slow; it is a hard matter to move forward the whole mass of the people concerned in a scheme of public education.

So don't blame the schools, blame every person; blame yourselves!

The Rural School Problem and the Relation of Agricultural Teaching Thereto.

The rural school problem may be considered as a large problem in itself. And there are many phases to the problem. Where population has decreased, there

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is an attendance so small as to hinder proper class organization or the incentives to work that come from the enthusiasm of numbers; there is the frequent changing of teachers, due to goodness knows how many reasons, but chiefly economic; there is the inexperienced girl-teacher trying her prentice hand in the rural school; there is the poor equipment and the non-attractive school and surroundings; there is the non-progressive board of trustees, interpreting trusteeship to mean doing only what the law makes compulsory and with no vision of the great dividends to be earned in investing generously in education; there is irregularity of attendance due to bad roads, sickness, work at home and indifference to education; there is the lack of play—that best part of all school life; there is need for medical inspection as witness the results in Middlesex County; there is need for truancy officers and real compulsory education; there is the dropping out of schools of the boys about the time they reach the Third Book—going out into life thus insufficiently equipped; there is the school work reflecting courses of study prepared with the graded urban school in view; there is the high school only at a distance, requiring boarding in town, and again giving instruction specially adapted to the urban dweller or the few pupils who may proceed to the college or to professional life.

In spite of the general progress undoubtedly being made, all these defects must be recognized and met. We have made considerable advancement in the past ten years; we have still a long way to go. We must ever set up higher ideals if continued progress is to be secured.

What is the best way to meet the defects in our schools, and what different kind of school should be aimed at? Our answer to the first question is: "The rural school problem will be best solved by the introduction of agriculture." We must make our school appeal strongly to our patrons as institutions "worth while"; deserving strong financial support as a downright good investment; deserving strong moral support as institutions giving children something which they cannot afford to do without. Not agriculture in the school so much as the "School in Agriculture." There will be a rationalizing of the work of the rural school; it will reflect its environment and meet the real needs of those depending on it for an education. It will seek to serve and not stand off apart from its best opportunities. It will not interpret agriculture as a narrow thing. It will mean play and music and books and social mingling as much as soils and crops and cattle, for life is more than meat as the body is more than raiment. The school will be for everybody; not limited to the uses of children, but bringing everybody to school, if not for instruction, then for no less necessary recreation. It will be the heart of the community, vitalizing every home. From it will arise new visions of education. "Without a vision the people perish." Through the new kind of school that lies dormant in our rural school of to-day will be developed other and better schools for country people.

What different kind of school might be aimed at? There is a kind that embodies the new spirit of co-operation. Perhaps it will necessitate breaking down of our sectional scheme of school administration and making the township or a group of schools the unit of administration. It will need a new kind of trustee; and perhaps a larger outlay of money.

In many places in old Ontario the old kind of school has served its day. There should be a consolidation of schools which will permit of the introduction of agriculture, domestic science, and manual training. Possibly this may be associated

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with a Township or County People's High School located in a central place (not in a town) in the township, managed by a township board of trustees composed of farmers. Such a school will have as its headmaster a teacher trained at the Agricultural College; his classes will be conducted chiefly in the winter months and pupils of all ages will be taught; his summer work will be to follow his pupils on to their farms, help in the other schools of the township and work his own little farm which is provided with his home. In time a teacher of domestic science will carry on similar work with the girls and women. The school will be well provided with adequate grounds and facilities for play. It will be a social as well as an educational centre for the township. There will be a good assembly hall in which public meetings, lectures, and social gatherings may be held. With this school at the head, all the other schools of the township will be closely associated, receiving from it help and inspiration.

Such a school might be! If the people desire it!

The 1913 Distribution of the Schools' Division.

The Schools' Division is the Extension Work of the Nature Study Department of Macdonald Institute. This department was established for the purpose of promoting agriculture in the schools. In this work the attempt is being made to bring the Agricultural College to every boy and girl attending the rural schools. All the work is done in co-operation with the Department of Education. During 1913 material was sent to about 400 schools; 356 of these received free material for experiments, demonstrations and school ground improvement. The others purchased bulbs, vines, and other material for which a charge was made. Instruction sheets were sent with the material for the guidance of pupils and teachers. Many School Progress Clubs were supplied with material. In all it is estimated that over 10,000 pupils in the rural schools came into practical touch last year with the work of the Agricultural College. The schools receiving material were located as follows: Algoma 5, Brant 5, Bruce 10, Carleton 5, Dufferin 5, Dundas 10, Elgin 33, Essex 5, Frontenac 1, Grey 12, Glengarry 3, Grenville 1, Haliburton 2, Halton 7, Hastings 16. Haldimand 7, Huron 13, Kent 21, Lanark 2, Lambton 11, Leeds 5, Lennox and Addington 2, Lincoln 8, Middlesex 31, New Ontario 1, Norfolk 6, Northumberland 3, Ontario 5, Oxford 12, Parry Sound 1, Peel 10. Perth 21, Peterboro 2, Prince Edward County 2, Prescott 1, Rainy River 5, Renfrew 7, Russell 1, Stormont 2, Simcoe 4, Temiskaming 2, Thunder Bay 3, Victoria 3, Waterloo 9, Welland 3, Wellington 11, Wentworth 11, York 9.

With about 6,000 rural schools in the province and 250,000 pupils enrolled in them, there is still room for development for the Schools' Division.

Mrs. Miller: May I be allowed to say a word in favor or in support of the rural school teacher. I feel that if she were considered a little, and helped a little in her work, that she might leave to the farmer, to his wife, and to his children something that would lighten the lives of all. I have been a rural school teacher; I have lived in the country, and I have known intimately the life of the farmer and the farmers' wives and children, and the little rural school. We all agree that the little rural school is at the root of the life of the country. Other things come and go, but the little rural school goes on. But it gets rather poor support. If a teacher were encouraged and supported, I am sure she would make the children so happy in school that when they came home their father and mother

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would be happier in their evening life. A hard day's work any man or woman may do, provided they have a fireside hour in which to forget the labors of the day. The school—the little country school—might be helped so that it would be a feature, a centre where, from time to time, all might gather and so enjoy an evening say once a month or once in two or three months, which would make a holiday to look forward to in the lives of the people living in the back concessions and townships. As it is, she is living alone on a bare ration. She has a great deal to do; she has not much to work with, but give her in the little school an organ—nowadays you can buy one for a small amount of money—she can play enough to teach the children songs. Do not discourage her when she leads them in playing. Some trustees have rules for teachers who are fond of playing with the children. Now, the lives of the country people are too grave, too deep, too bare, too barren of that very thing which is the greatest factor in education. Give them time to play after school; give them time on Saturday and encourage them to play. Let them be taught playing in school; let them have time for picnics and affairs of that sort, and your rural schools will be powerful factors in making the lives of the children of the country brighter and happier in every way.

A MEMBER: I have indeed listened with a great deal of pleasure to the lady's remarks, the excellent remarks she has thrown out about the rural schools. From what has been said here in some of the addresses the ladies seem to get the preference in the schools, especially in higher education. Often the young men who were taught agriculture in the school were supposed to be of no use when they came out of school, and consequently they were kept at home at a very early age. Their education is over by the time they are men and consequently does not amount to very much. Now, the idea of having the people in these country districts meet once a month is good. What struck me here is the idea of a literary and debating society in schools, to meet every two weeks or once a month, and in this way our secondary education, as it were, might begin. Education for the boys who have had no chance to go to school but who have had to stop at home. Let them organize literary debating societies and have readings and recitations. They will thus learn to speak in public and meet each other socially. This is one way in which they can be educated.

A MEMBER: It is one of the most important ways. Also the older people of the section are brought together in social intercourse, and by this social intercourse we have solved the problem which will enable us to push for greater advance in the schools, and to reach that mark of national prosperity which agriculture is going to reach. Now, these debating clubs, aside from teaching the young people to speak in public, will prepare them to take a part in local affairs, social, political or commercial.

PROF. ZAVITZ: I just want to add a word to what has been said in regard to the country schools. At our consolidated rural school here at Guelph we have a parents' and teachers' meeting. They meet every month to discuss matters regarding the welfare of the school. That is something, I think, which might take place in all the rural schools of Ontario with very great advantage indeed.

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CO-OPERATIVE EXPERIMENTS IN WEED ERADICATION FOR 1912 AND 1913.

PROF. J. E. HOWITT, O.A.C., GUELPH.

This is a new line of experimental work commenced last year. As announced at last year's meeting of the Experimental Union, the object of this work is to have carried on, by men on their own farms, experiments in the eradication of weeds, the results of which will furnish data, from which definite statements may be made regarding the best methods of controlling the various bad weeds. At the present time it is very hard to get any two men to agree as to which is the best way of dealing with any particular weed. Then again a man may have tried a method of eradication on one kind of soil and found it satisfactory, and recommended it, but it may not be a suitable method for some other kind of soil. Without illustrating further it is sufficient to say that we have very little definite knowledge concerning the eradication of weeds, and hence the necessity for such experiments.

In starting this work, it is thought wise to confine our attention, at first, to four of the common troublesome weeds. If the experiments progress satisfactorily, it is hoped to add more bad weeds from year to year, until exact information has been obtained about the eradication of most of the bad weeds of Ontario. The weeds selected for the experiments in 1912 and 1913 were: Perennial Sow Thistle, Twitch Grass, Bladder Campion and Wild Mustard. Six experiments in all were outlined, namely:

1. The use of rape in the destruction of Perennial Sow Thistle.
2. A system of intensive cropping for the eradication of Perennial Sow Thistle.
3. The use of rape in the destruction of Twitch Grass.
4. A method of cultivation and cropping for the extermination of Twitch Grass.
5. A method of cultivation and cropping for the eradication of Bladder Campion.
6. Spraying with iron sulphate to destroy mustard in cereal crops.

During the past two seasons about 26 men co-operated in this work, including 8 District Representatives of the Ontario Department of Agriculture. Summarizing the reports received, it is found that four men tried experiment No. 1, "The use of rape in the destruction of Perennial Sow Thistle." Three report the method entirely successful, one only partially successful, but in looking over the report of this man, it was found that he had not followed the directions given. All, therefore, who followed the directions given found this method a success.

Five men tried experiment No. 3, "The use of rape in the destruction of Twitch Grass." Four report complete success, one only partial success.

Three men tried experiment No. 4, "A method of cultivation and cropping for the extermination of Twitch Grass. Two secured fairly satisfactory results, and one reported the method of little use. None, however, had completed the experiment when they made their reports. Just here it might be mentioned that the reports received of experiments 3 and 4 indicate that rape is a much more satisfactory crop to use in the destruction of Twitch Grass than buckwheat.

Two men tried experiment No. 5, "A method of cultivation and cropping for the eradication of Bladder Campion." Both reported success with this method.

Twelve good reports were received of the results of experiment No. 6, "Spray-

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ing with iron sulphate to destroy mustard in cereal crops." All reported success with this method. The results of these co-operative experiments on spraying with iron sulphate to destroy mustard, show that mustard may be destroyed in oats, wheat and barley, by spraying with iron sulphate without any serious injury to the standing crop. It should also be added that fresh seedings of clover were not injured to any extent by the iron sulphate. The points brought out by this experiment were:

1. The necessity of spraying early, just when the plants are coming into bloom. If the spraying is left too late the older plants will not be destroyed by the solution, and will form seed, and hence the experiment will not be entirely satisfactory.

2. To spray thoroughly, and with a good pressure. In order to spray thoroughly with an ordinary broadcast attachment, it is necessary to keep the horses walking very slowly. If an attempt is made to cover the ground quickly, some of the plants will be missed, and the results will not be satisfactory.

3. In regard to the cost of spraying with iron sulphate it was found that the cost of the material per acre varied from $1 to $2.40. If the iron sulphate is bought wholesale, it can be purchased at $1 per cwt., so that $1.50 to $2.50 per acre should cover the entire cost of spraying.

4. The question is often asked, "Does it pay to spray to destroy mustard? Does the destruction of the mustard increase the yield of the crop?" In the reports of the experiments received various opinions have been expressed regarding the improvement of the crop due to spraying. Some men claim to have noticed a decided improvement, while others report no noticeable improvement. In order to get some definite information concerning this point, Mr. G. B. Curran, District Representative of the Ontario Department of Agriculture, Napanee, Ontario, had a special experiment carried on with iron sulphate to destroy mustard. The following is an account given by Mr. Curran of this experiment:

"On June 6th, we sprayed a part of a field of barley on the farm of D. N. Lucas, Odessa. We used iron sulphate at the rate of 80 pounds to a barrel of water, 40 gallons, and applied about two barrels per acre. We used a spray motor horse-cart with boom. I visited this field ten days after spraying, and you could distinguish the sprayed part from the unsprayed across two fields. The unsprayed part was a mass of yellow bloom, while the sprayed part contained only an occasional head of mustard. I asked Mr. Lucas to harvest and thresh each part of the field separately. I quote his figures as follows: Length of field 783 feet, width not sprayed 330 feet, width sprayed 210 feet. The sprayed portion yielded 150 bushels of barley, the unsprayed portion yielded 180 bushels. The sprayed part of the field contained 3.8 acres, and yielded 150 bushels, an average yield of 39.4 bushels per acre. The unsprayed part contained 5.9 acres, and yielded 180 bushels, an average of 30 bushels per acre. The increased yield per acre was a fraction over 9 bushels. I valued the barley at 60 cents per bushel.

"This experiment, while by no means conclusive, indicates that the destruction of the mustard does increase the yield of the crop."

It is intended next year to add more weeds to our experimental list, and we hope that the number of experimenters will be increased. It is believed that the results obtained from these experiments are of great practical value and that they should be of interest to all engaged in Agriculture.

A MEMBER: Can you destroy dandelion?

PROF. HOWITT: Yes, six sprayings during the year will do this.

A MEMBER: Would rape sown broadcast be as effective as sown in the drill?

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PROF. HOWITT: No, I certainly think rape sown broadcast would not be as effective as sown in the drill. The plants are smaller and have not the same smothering effect as has rape sown in drills. I remember one year the rape was sown in drills, the land was manured and properly cultivated. We got twenty-seven tons of rape per acre; we could not have done that if we had put it in broadcast. I may say that the results of experiments show that where it has been sown broadcast and in drills, the drills have always given better results than when sown broadcast.

A MEMBER: I would like to know how long cattle may be kept on rape; is there any time?

PROF. HOWITT: You want to have the rape a good height to get the best smothering effect.

PROF. ZAVITZ: I may say that I have had some experience in using rape against all these weeds mentioned in this report; against weeds in general, but against the Canadian Thistle in particular. We sowed about ten acres of rape for young stock on the farm, and also for the purpose of fighting the weeds. Four years ago we had one ten acre area which was very badly infested with Canadian thistle. We sowed this ten acre area with rape broadcast, and we did not find it had very much effect in fighting that kind of thistle. The year following, the adjoining field of ten acres was also sowed with rape; this time ridged up and sown in drills and kept cultivated; at least cultivated several times during the season, up to the time it was ready to pasture, and in this case, the following year, the thistles were practically absent and the field has been clean since; whereas in the first field where the rape was sown broadcast the thistles were very little disturbed, if at all. I think it is important that the rape is sown in drills. It will be so much better; will smother the weeds, and you will get more benefit from it when you pasture it as well. We kept from twenty to twenty-five growing head of cattle on these ten acres, from the first of September until snow fell, and this kept them in pasture when there was an absence of the usual grass pasture. I think when we are fighting weeds we have got to use such methods as these. In special cases, of course, you can fight the weeds in other ways, but as a general rule the busy farmer has to fight his weeds by these good methods. In this way he not only fights the weeds successfully, but at the same time makes the best use of his land. The use of rape on say ten acres of a stock farm, I think, works with good effect.

The rape crop is a very valuable one, the seed is cheap, being ten cents per pound, and one pound and one-half of good seed is quite sufficient to produce a good crop per acre when the land is well cultivated; it is one of the best crops you can have to clean the land. The wonder is there is not more rape cultivated in Ontario.

A MEMBER: Is it home grown seed you use or imported seed?

PROF. ZAVITZ: On a field that has been sown with rape, if not properly cultivated for the next crop, you will often find rape plants growing up with the grain, which when threshed contains these rape seeds. Farmers save this seed and sow it for two or three years while the supply lasts. I do not know that it is grown as a crop by itself from which to get seed. I think it is mostly imported seed.

A MEMBER: What should you ask for when buying seed—"Dwarf Essex Rape?"

PROF. ZAVITZ: Most decidedly. If you buy rape seed be sure and ask for "Dwarf Essex Rape." If you do not you may get bird seed rape which is used

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for feeding birds. It is an annual and when it comes out in blossom it is pretty nearly like wild mustard. I have been a witness in a lawsuit through a misunderstanding between people on this point. One man wanted to get so much rape seed; he did not ask for rape seed, but asked for pasture seed rape when he should have asked for "Dwarf Essex" rape.

A MEMBER: Why do not the seedsmen stop selling bird seed rape altogether?

PROF. ZAVITZ: Sometimes it does not come through the seedsman. Up north here a merchant had been asked several times for rape seed, and a traveller came along and the merchant said to him: "Do you handle rape seed?" and the agent said, "I can get you some." "All right," said the merchant, "get me one hundred pounds." The merchant got the one hundred pounds, sold it to his customer who sowed it in that section, and after a while instead of producing nice broad leaves it began to get yellow, and came out in bloom, the result being there was a lawsuit. They had a very lively time. There were forty or fifty acres sown with that seed; it was sown as rape seed, but was really just the seed that is used to feed birds.

A MEMBER: How does it affect cows?

PROF. ZAVITZ: The rape will taint the milk about the same as turnips.

THE DISPOSAL OF SCREENINGS AT TERMINAL ELEVATORS.

J. R. DYMOND, SEED LABORATORY, OTTAWA.

In connection with the working of the Canada Grain Act, immense quantities of Western grown grain are cleaned at the terminal elevators at Fort William and Port Arthur.

The extent to which grain is sometimes contaminated by weed seeds is shown by the following analysis of a sample of a car of Western grown flax. The weed seeds made up sixteen per cent. of the total weight of the car. One ounce contained the following number and kinds of weed seeds.

73	Hare's-Ear Mustard,	152	Lamb's Quarters,
106	Stinkweed,	10	Cinquefoil,
1,051	Brassica sp.,	14	Black Bindweed,
429	Western False Flax,	2	Ergot.
170	Round-seeded False Flax,		
1,009	Tumbling Mustard,		
2,838	noxious.	178	others.

A sample representing over 25,000 bushels of wheat contained only 92.6 per cent. by weight of pure wheat, the remainder being made up largely of weed seeds, chiefly wild oats, black bindweed and lamb's quarters. These may be extreme cases but samples as badly contaminated as the above are by no means rare.

The average dockage, of course, varies from year to year, but may be put at from 5 to 7 per cent. in the case of flax, and from 2 to 3 per cent. for wheat.

Last year (Sept. 1st, 1912-Aug. 31st, 1913) the shipments of screenings from Port Arthur and Fort William were as follows:

To United States	35,505 tons	1,659 lbs.
To Montreal, Que.	565 "	510 "
To Cartier, Ont.	75 "	1,200 "
To Goderich, Ont.	284 "	410 "
To Kingston, Ont.	1,328 "	420 "
To Mount Forest, Ont.	30 "	... "
To Depot Harbour, Ont.	22 "	1,000 "
Total in Canada	2,305 tons	1,540 lbs.

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Following are the results of an analysis of about 6,000 tons of screenings shipped from various elevators at two or three different periods of the year to Buffalo, Chicago and Duluth, and should, I think, give a very good indication of the composition of the 35,000 tons of screenings shipped to the United States last year.

The composition of this material is roughly as follows:

37 per cent. Scalpings.
7 per cent. Succotash Flax.
18 per cent. Buckwheat screenings.
38 per cent. Black seeds.

The first three of these materials, 62 per cent. in all, may, I think, be considered of undoubted feeding value. It is only the remaining 38 per cent. made up of small weed seeds and chaff which needs immediate and thorough investigation.

The separation of these *"Black seeds"* as they are called, is effected by the 1-14 in. perforated zinc screen. The botanical composition of these four materials is roughly as follows:

Scalpings 65 per cent. wheat, 25 per cent. other grains, 3 per cent. weed seeds and 7 per cent. straw and chaff.

Succotash Flax 30 per cent. flax, 40 per cent. broken wheat, 15 per cent. weed seeds chiefly wild buckwheat, lamb's quarters and wild oats and 15 per cent. chaff.

Buckwheat Screenings 58 per cent. wild buckwheat, 29 per cent. of broken wheat, oats and flax, 9 per cent. weed seeds and 4 per cent. chaff.

Black Seeds. Before analysing this material a separation was made of it by means of the 1-25 inch perforated zinc sieve. This is not done in practice and it is doubtful if it is practicable.

The 38 per cent. of Black seeds was thus separated into 7 per cent., which passed through the 1-25 inch sieve, and 31 per cent. above it. Of the portion passing through the 1-25 in. sieve, 22 per cent. was Tumbling mustard, 63 per cent. dust, 10 per cent. Lamb's quarters and 5 per cent. other weed seeds. Experiments should be undertaken to determine the exact feeding value of this portion of the so-called "Black seeds." The extremely small size of these seeds makes it almost impossible to destroy all of them by any practical method of grinding, and if their influence on the feeding value of the rest of screenings were known, we might be able to show the manufacturer who uses screenings that by removing them he is not only reducing the danger arising from the occurrence of unground weed seeds in his feed, but also actually increasing its value. It is usually stated by manufacturers that even if some seeds have a poisonous or otherwise deleterious effect they are present in such small quantity that their influence is unfelt. This, however, is not known, and no one has yet thought the matter of sufficient importance for experiment.

Of the portion passing over the 1-25 in. screen, 53 per cent. is Lamb's quarters, 3 per cent. wild mustard, 8 per cent. other mustards, 9 per cent. other weed seeds, and 27 per cent. chaff. Experiments to determine the feeding value of this material as a whole, and of the more important weed seeds in it must be made before it can be used as a feed intelligently. Lamb's quarters is known to have practically the same chemical composition as alfalfa hay, and it is said that in Russia it is used for making bread. It is closely related to the cultivated Chenopodium guinoa which furnishes the chief grain crop of the High Andes. Another species of Chenopodium, viz., C. ambrosioides var. Anthelmintica, is grown in a section of Maryland for the oil which is distilled from its seeds. The seeds

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of the Crucifers (mustard family) are known to be rich in oil, and it is not improbable that this entire material (i.e., the "Black seeds") may sometimes be used in some other way than for feed.

The price paid for screenings is regulated by the price of corn, oats and mill feed. Last winter(1912-13) screenings sold in Fort William at four dollars to five dollars ($4.00-$5.00) per ton. The price, of course, varies with the quality of the screenings, a high percentage of useful grain increasing the value of a sample.

Buckwheat screenings last year sold at Fort William for fourteen dollars ($14.00) per ton. Wild mustard (Brassicas) bring twenty dollars ($20.00) per ton in the United States. The "Black seeds" when finely ground sell at nine dollars and fifty cents ($9.50) to twelve dollars and fifty cents ($12.50) per ton, usually selling about five dollars a ton cheaper than bran. One concern was said to have sold a molasses feed made of half molasses and half ground screenings at twenty-eight dollars when oil cake was selling at twenty-six. The duty on screenings entering the United States is 10 per cent. ad valorem.

Uses of Screenings.

Considerable quantities of screenings are fed every winter to sheep. The sheep are fed in large sheds operated in connection with railway companies, on whose lines the sheep are carried from the ranges. The following sheep-feeding stations in the vicinity of Chicago were visited. On the Chicago, Milwaukee, and St. Paul Railway, at Kirkland, Ill.; on the Chicago, Burlington and Quincey Railway, at Montgomery, Ill.; and on the Rock Island Railway at Stockdale, Ill. Besides these, other railways entering Chicago maintain similar stations. Such stations are also provided at Osseso, New Brighton, and Anoka in the vicinity of Minneapolis.

At the Kirkland station, which is typical of such places, there is acommodation for fifty thousand (50,000) sheep at one time. The sheep are fed here from one to sixty days depending on the condition of the sheep, and often too on the markets. Shearing sheds are provided and large numbers are shorn at the station.

Sheep taken from the ranges are usually fed for about thirty days. At first they are given only hay. Then a small quantity (½ lb. per day) of light, chaffy screenings is added. Gradually this quantity is increased until in about a week or ten days the sheep have access to the "self-feeders" from which they eat all the screenings they care for (about 2 lbs. per. day). At the same time the proportion of chaff in the screenings is decreased and the proportion of seeds increased.

The sheep are kept on a diet of pure screenings for only a day or two and then a little cracked corn is added. The proportion of corn to screenings is increased gradually until the ration consists of half or slightly more than half corn, the sheep being given all they can eat of this mixture as well as hay. The aim of the feeder is to get the sheep on a diet of corn as soon as possible, but pure corn is too heavy for the sheep, and so the screenings are used as a sort of "filler."

Formerly elevator screenings contained much shrunken and broken wheat, oats and barley, but with improved methods of recleaning the screenings, practically all of this material is removed, and only the smaller weed seeds and chaff is available as screenings. Last winter and spring such screenings cost at the feeding stations $10.00 to $12.00 while corn at the same time cost $20.00 per ton.

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This material is not considered by the feeders to be as nutritive and as wholesome as some seem to think it is, but the sheep eat it and thrive on it when fed in this manner. On such feed the sheep usually gain from twelve to fifteen pounds during the first thirty days. After that they gain less rapidly.

It was stated that fifty thousand sheep would eat about two cars of screenings and a car of corn per day. Seedhouse screenings and screenings containing a large proportion of broken flax are avoided.

At Kirkland much of the manure accumulating in the sheds is hauled away by farmers during the summer and put into piles until fall. The manure when so piled "heats" and the vitality of many of the weed seeds which have become mixed with the manure is destroyed. Farmers who have used that manure admitted that large numbers of weeds made their appearance after its application. Its use, however, has not resulted in any serious spread of noxious weeds. This is explained, I think, by the two following circumstances.

1. In that district, as in other parts of Illinois, and neighbouring states, large quantities of corn are grown. This sheep manure is put on corn ground and by constant cultivation of the corn the weeds are destroyed before they can mature seeds.

2. Practically all of the farms around Kirkland are worked by tenants, and as rents are so high and land so valuable, the careless and slovenly farmer is crowded out. It was my observation that the farms were all practically free from noxious weeds, although I did see one meadow badly contaminated with tumbling mustard, very probably introduced through screenings. Although the use of this manure has resulted in no very serious spread of weeds, I consider that its use involves considerable risk of introducing some of the worst weeds the farmer has to fight.

At Montgomery and Stookdale the American Guano Company have put up factories where this sheep manure is dried and pulverized and from it is made a fertilizer used largely on golf links, country estates, market gardens, etc.

Another use that is made of elevator screenings is in the manufacture of mixed feeds, chiefly molasses feeds. Usually it is only the finest weed seeds and smaller pieces of broken wheat and flax that are used in these feeds.

Mills that make a specialty of handling screenings are equipped with cleaning machinery which separates all the whole kernels of wheat, barley, oats or flax, that the elevators have failed to remove.

Straw and chaff are taken out of the screenings at the same time as this separation is made. The material left after these grains are removed is separated into two grades by means of the 1-13 or 1-14 inch perforated zinc sieve. The material passing over this screen consists largely of wild buckwheat and broken wheat but there is often a considerable sprinkling of broken flax and of the larger weed seeds such as purple cockle, ball mustard, etc.

Most of the buckwheat screenings so separated are used along with cracked corn, kaffir corn, barley, wheat, sunflower seed, etc., as a chicken feed, although I believe some of it is used in other ways.

The seeds of the wild mustard and other species of Brassica are separated from the other weed seeds by taking advantage of the fact that they are spherical in shape and will roll if placed on an inclined surface. An endless belt running at a small angle from the horizontal is one device that will accomplish this separation.

Before the fine seeds, left after this separation has been made, are ready for

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grinding, they have to be put through a reel to remove the fine sand which would otherwise injure the rolls.

The exact method and the thoroughness with which these seeds are ground varies in the different mills. The grinding is done usually by a combination of one or more rolls such as are used in flour mills or by an attrition mill. After each "break" (i.e., passage through the roll or attrition mill) the material passes to a reel which removes the fine material and sends the coarse material on to the next "break" to be still further pulverized.

To reduce to a minimum the possibility of the final product containing vital weed seeds the mesh of the wire gauze used in these reels should be sufficiently fine to prevent the passage through it of the smallest weed seeds found in screenings.

These ground and bolted grain screenings are mixed with various other ingredients such as cottonseed meal, linseed meal, gluten feed, and molasses, in the manufacture of molasses feeds. Other mills which handle screenings make only the separations described above and grind the fine screenings. The finely ground material then constitutes their final product and is sold for use in making molasses feeds, as a base for stock foods, or in some cases for feeding in its natural condition. Some of this ground material has lately been shipped to the Argentine Republic and to the West Indies.

This material by itself does not usually make a very palatable feed on account of the occurrence in the screenings of certain seeds having a bitter or otherwise disagreeable taste. The mixture of molasses with the feed overcomes this difficulty besides increasing greatly the carbohydrate content of the ration.

Feeding Value.

Although thousands of tons of screenings are fed every year in the United States as an ingredient in molasses feeds, or in stock foods, and in an unground condition to sheep, nothing very definite is known about their feeding value as a whole or of the individual weed seeds.

An experiment on the digestibility of ground grain screenings was conducted at the Maryland Experiment Station and is reported in Bulletin 160 of that station. On page 3 of that report a botanical analysis of the sample used is given and on page 6 the chemical analysis is given as follows:

Protein	14.52%
N-free Extract	47.37%
Fat	7.65%
Fibre	13.50%

On page 20 the digestibility of each of these is given as follows:

Crude protein	65.47%
Crude fibre	17.48%
N-free extract	80.59%
Fat	63.59%

It is stated that ground grain screenings is more digestible than distiller's grains, but not quite as digestible as wheat bran.

A prominent molasses feed manufacturer stated that the molasses feed which his company made from a certain car containing a large proportion of flax seed screenings brought numerous complaints from users of the feed. In North Dakota Sta. Spec. Bul. 31, pp. 317, the author quotes from four letters regarding the loss of animals through the consumption of flaxseed screenings. "In

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one herd of nineteen, all died, while in a second of ten, five died." It is generally found that ground screenings are unpalatable to stock and are not eaten unless the taste is covered up by molasses. The Seed Commissioner is constantly in receipt of letters and samples of mill feeds, which have caused the death or serious injury to the health of animals. Examination of these quite often reveals the presence of unground weed seeds. Some stock food manufacturers use ground screenings as a filler for their medicines. This may explain the complaints sometimes heard about injurious effects following their use.

Such are some of the reasons which led us to suspect that screenings contain some injurious materials which if not always apparent in their effect on the health of animals nevertheless decrease the feeding value of those seeds which in themselves are of value.

I have tried to indicate in the above some of the points which we are trying to have cleared up and it is to be hoped that before long we may be in possession of the necessary information that will enable us to make the best possible use of this waste material without any danger to field agriculture from the spread of vital seeds.

PROF. ZAVITZ: In connection with the eradication of weed seeds there was a Committee appointed two years ago, and I believe they have done very good work indeed, particularly in helping to regulate the Act, and the question came up as to the continuation of that Committee. I believe it would be a good thing to continue that Committee, more particularly with a view of working along the lines of the investigations that have been carried on in connection with the office of the Seed Commissioner at Ottawa. They have done some good work this year. Here we have the results of some very careful investigations brought out through the medium of the Experimental Union, and given publicity in that way. While there would not be a great deal of work for this Committee to carry on, it seems to me there is still room for work there, and that the Committee should be reappointed to keep watch on these questions, or any others which might come up, and to make suggestions and to assist in preventing, in any way possible, the introduction of so many weed seeds in the screenings coming into the country.

A MEMBER: Is there anything in the law to prevent weed seeds from coming in here when buying grain, or is that just in seed grains? Up in our country, that is in the Temiskaming district, we import a great deal of feed, oats and hay. I purchased about eighteen bushels of Western oats, and the horses would scarcely look at them. I took them to one of the neighbors and got them cleaned, and there was just fifty-six pounds of pure weed seeds. I took them home, and the horses ate them readily. I do not know whether there is a law to prevent weed seeds coming in with feed grains.

PROF. HARCOURT: As far as I know, and I think I am correct in stating it, it says, "Seed that is offered for sale for seed purposes." The Act says nothing about feed that is offered for sale for feed purposes; It says, "This Act shall not apply to feed that is held for storage or for feed purposes." It seems to me the point that has been brought up is a good one, and one that should be looked into by the members of this Weed Seed Committee.

A MEMBER: Do you know if the Adulteration Act has anything to do in connection with that?

PROF. HARCOURT: The Adulteration Act simply deals with the ground material; they do not prevent the selling of oats, wheat or barley, as such, and I suppose as long as you have a mixture that you can put a name on it will have

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to go as that. If it is 90 per cent. weed seeds, 2 per cent. oats, it might sell as oats and you would have no redress at law. The weed seed question, I think, is going to become more and more important, that is to those who have dealings with these seeds, because there seems to be an endeavor on the part of the United States Government to try in some way or other to frame a law to prevent them from going into the States. Over 35,000 tons went there last year, and 2,300 tons were used in this country, so that if they are prevented from going into the States at all then, of course, they will have to develop for them a market in the West Indies, the Antipodes or somewhere else; we do not want them here. There was a suggestion made in Mr. Dymond's paper of the possibility of feeding what he calls black seeds, and removing very fine seeds. These are the ones there is difficulty in grinding, and the ones that are likely to be poisonous, and if these are removed the balance of the material would be perfectly safe if ground up and used in that way. Immense quantities of weed seeds are sold from time to time.

MR. TOOLE: Just a word in regard to weed seeds while I think of it—those weed seeds we get in our ordinary clover and alsike crops. I do not know that I will tell you all about it; it took me very nearly thirty-five years to find it out. A lawyer would not give it at the price I am going to give it to you; very few professional men would do it. When you sow your Red Clover or Alsike of course you are supposed to have your land in pretty fair condition; sow the clover a little bit thicker than you have been doing, and it will crowd out the only weeds that will come up in a clover patch. If you sow it a little bit thinner all the weeds will come up. That little secret is worth hundreds of dollars to farmers. If you sow it thick enough to kill all the weeds you may not get as good a crop of clover, but at the same time when you get the seed from it, it will be nice and clean, and there will be scarcely anything to clean out. There is a great difference in the variety of land. If you take it where it is loamy there will be a great many weed seeds that will grow which will not grow where there is clay. Loamy soil will grow weed seeds, and a great many, because it will germinate these seeds quickly. In the spring, instead of cultivating and bringing these weeds up to the surface where they will germinate quite readily in your grain, if you have soil of that kind, just try plowing it, and cross cut everything clean, and see the difference in the amount of weeds that will germinate. Now, I have tried this for years. Plowing takes very little more energy or time than the other process takes. It may take you a long while to find out the difference if you had to experiment for yourself, in fact the discovery to me means hundreds of dollars, and to every farmer who will apply the secret I have given you.

A MEMBER: Do you always get as good results from seeding on spring plowing?

MR. TOOLE: We do not. This is well known.

PROF. ZAVITZ: I think before we leave this subject we should get into good working order for the following year. What are we going to do? My idea would be to appoint a Committee like the one last year, but with some improvements, and to have the wording of the resolution of last year changed a little and improved thereby. I would suggest that we add to last year's resolution the words "In grains and screenings." This will cover that important point which Mr. Nelson, from the Temiskaming District, brought up. The Committee last year was: G. H. Clark, R. Harcourt, C. A. Zavitz, G. E. Day, and J. E. Howitt. I am not a very active member of that Committee, and will drop out, and I

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would like to see the name of Mr. Dymond, who carried on these investigations last year, added to the Committee in my place, therefore, I will move: "That a Committee on the prevention of the Importation and Distribution of Noxious Weed Seeds in Grains and in Screenings be appointed; and that it be composed of G. H. Clark (Chairman), R. Harcourt, J. R. Dymond, G. E. Day and J. E. Howitt."

MR. NELSON: I will second that motion.

The motion was carried.

MR. TOOLE: I am not much in favor of the motion. We do not always get at things so easily. The right way is to keep our feet on the earth. It is the best way.

PROF. ZAVITZ: Before we go on there is something else. What about the weeds here in Ontario? Mr. Nunnick said something of the way in which weeds were destroyed in Ontario, or were not destroyed. Is there anything that can be done in regard to weed seeds in Ontario? Is there any room for that subject in this Experimental Union of Ontario? We have done some great work in regard to Apiculture, Poultry, and Domestic Science. If we had not undertaken this work we would not have the Macdonald Institute with us to-day. In this connection there is one thing in Mr. Nunnick's address, a point in connection with which I think something could be done by this Union in the way of remedy; that is in regard to laws regulating the cutting of noxious weeds on road sides and waste places. At the present time you may go through the rural sections of Ontario during the whole year and see thousands of weed seeds being produced. There is the Perennial Sow Thistle and other weeds from which the seeds blow long distances from these waste places and roadsides to cultivated farms. A man may cultivate his field ever so carefully, but if these seeds are allowed to develop in these waste places they will blow for long distances and he will find it impossible to control them. They will germinate on his land and make eradication almost impossible. At the present time, as you know, the control of the cutting of weeds on roadsides is carried out, or supposed to be carried out, by local inspectors. Now, I do not think that the weed law in Ontario will ever be carried out successfully by a local inspector. A man in the neighborhood does not feel like insisting that his neighbor cut his weeds, and if the neighbor fails to do so he does not like to fine him. It seems to me this Experimental Union should try and do something to put the law in force which would have some effect in preventing these weed seeds on roadsides and waste places in Ontario from spreading. It seems to me, if we get the right people behind it, it can be worked all right, and this Experimental Union is the place to start. Create a law that will be effective, not such a law as we have at the present time, and enforce it in every County in Ontario.

MR. NELSON: I was so successful in the first point, I should like to bring in another. I would say to add to that, "the right of way of the railways." It would be a great blessing if we could have the railways included along with the other roadways.

A MEMBER: As a stranger in Ontario, I had no idea of addressing you to-day, but there is something here, I think I can suggest, which may be of use. I came to this country in the spring. I have seen a large amount of weed seeds throughout the farming districts, but I say all honor to what has been done already in preventing the spreading of these seeds. Might I suggest that we follow along the same line as is done in the Old Country, that is in regard to their fences. There is a law there compelling every man to prune his fence.

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Of course, you may not understand what is meant by a fence there; it is not the same as a fence here, there it is a hedge. I would suggest that instead of the local man attending to it in his neighborhood wherever these weeds crop up, that we have a sort of general surveyor with power to serve notice that within a certain time every occupier of land adjoining the roadside must have his weeds cut or destroyed. I fancy that would be a way out of the difficulty.

PROF. MCCREADY: I had some correspondence recently with some officers of the Department of Agriculture, Saskatchewan, regarding agricultural education, and I was told that there they adopt a scheme of township representation by the Department of Agriculture who have men to look after this weed inspection and already about seventy-five of the different municipalities in Saskatchewan have these men appointed. They are township officers, but they are also useful in other ways to the Department of Agriculture. The Department of Agriculture at any rate, brings them to the University for short courses of instruction in all sorts of things, and amongst others they get instructions in this weed seed work. We might get legislation passed enabling us to appoint township officers like that, but not subject to township control. Perhaps Mr. Nunnick would be able to tell us more about this.

PROF. ZAVITZ: Mr. Nunnick is not here just at present, but he was speaking to me about this matter, and if there is nothing else before the meeting I have a resolution here reading:

"That a Committee be appointed to make a study of the present Weed Acts of the different Provinces of Canada, and if possible to make suggestions as to how eradication of weeds in Ontario could be made more effective." In connection with this resolution I would name the following men on this committee: J. E. Howitt (Chairman), Hon. Nelson Monteith, and W. J. Lennox.

The Chairman declared the resolution carried.

MR. TOOLE: I feel that you should not be too hard in these instances. I know what it is to be a farmer. There are hundreds of men all over this country laboring under difficult circumstances. I want to impress this point upon you: it is better to err on the side of benevolence or leniency towards these men; these thousands of men over this Province who are laboring to support their families, and at the same time working hard to eradicate their weeds. I know in many cases they have all they can do to live, and with the labor market in the condition it is makes it almost impossible to do much towards the eradication of weeds. That is the reason why I say to keep your feet on the earth, because the conditions are really hard among the masses of our people.

A MEMBER: It is all very well to talk about being benevolent, and I would not be too hard on any man, but what about the man who is keeping his place clean, or trying to, but cannot do it because his neighbors are allowing their places to be overrun with weeds, very often through trying to farm more land than they can properly manage?

MR. TOOLE: I am only suggesting that we should rather err on the side of leniency than on the side of severity.

PROF. ZAVITZ: I do not think there is anything in connection with this discussion of a controversial nature whatever; we just want to come to some arrangement which would be more effective.

A MEMBER: I wish Mr. Toole had made his remarks a little earlier, in order that we might more fully discuss the point. I do not think it would be right, as a former speaker has said, to allow one man to have his place covered with weed seeds from neighboring farms or roadsides, simply because his neighbors did not keep their fields clean.

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WORK IN ONTARIO OF LANDS COMMITTEE OF COMMISSION OF CONSERVATION.

F. C. NUNNICK, OTTAWA.

In this paper will be given only those facts and figures of the survey which are of most interest to those experimenting with field crops. I shall read, therefore, some extracts from the general summary of the report received from the collector in Ontario. The survey work in Ontario in 1913 was conducted in the following counties: Peterboro, in Otonabee Township; Simcoe, in Tecumseh Township; Middlesex, in Westminster Township; Temiskaming, in Dymond Township; Renfrew, in Admaston Township.

As a rule, farmers do not pay much attention to the rotation of crops beyond the simple fact of not sowing one crop two years in succession. The best farmers pay considerable attention to this matter, but not enough attention is paid to it by the average farmer. In nearly all the districts visited strict attention is paid to the cleaning of the seed grain and the sowing of the best grain grown on the farm, but very little attention is paid to the varieties grown. In Peterboro county forty farmers were visited, and among the forty farmers visited, there were seventeen different varieties of oats being grown. It is quite evident that there are not seventeen best varieties, and it would seem that an effort and some study should be made to have a greater uniformity along this line. Too many farmers hear of some new variety, and without knowing anything about the suitability of it to their district, the strength of straw or the percentage of hull, will buy the new variety and sow it. It would be much better for them to sow the varieties that have been tested and proven to be of good all-round quality. The farmers, however, in Ontario know the names of the varieties they are sowing pretty fairly well. In one district in Quebec, where thirty-four farmers were visited, twenty-six of them did not know the names of the varieties being sown, and among the other few who did know the names, several varieties were being grown. This question of obtaining the best variety of grain cannot be too strongly impressed upon the mind of the average farmer.

A great majority of farmers in Ontario understand the value of barnyard manure, but a very small number understand how to care for or apply the manure to the best advantage, consequently there is a great loss every year in this respect.

There is a deplorable ignorance of the names and methods of eradication of weeds among the majority of the farmers, consequently weeds are increasing everywhere, and nearly every weed known in the catalogue may be seen growing upon the roadsides. This is something that should be taken up by the local municipal authorities, and a strenuous effort made to keep down these robbers of soil fertility.

We find that very few farmers take much interest or pride in having and caring for a farm wood-lot. A few give some attention to the wood-lot, if it contains some maples, but very little thought is given to the future wood supply.

Larger implements and three and four horse teams are coming into favor and many farmers are installing gasoline engines for their house and barn work.

The water supply is abundant in all the sections visited in 1913. The average farmer is very careless about the well and its surroundings, it being often poorly situated, with more attention given to its convenience than to sanitation. Very few farmers take the trouble to have water piped into the house.

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There is a general lack of interest in the sheep industry, and poultry is almost entirely neglected by the average farmer.

There is a great scarcity of labor throughout the sections visited, which, to remedy, a great deal can and must be done by the farmer himself. He should plan a system of farming so that he can employ his help by the year, and at the same time use labor-saving machinery. A great many different suggestions are made by the farmers regarding the solution of the labor problem, some of which are not very practicable. Some of the suggestions, however, are well worth considering. One man suggested the establishment of government labor bureaus in the towns so that the farmer and laborer could be brought more easily together. It seems to be the impression that there are men in the country, if there could be some way of finding them and getting them on the land. Nearly all the farmers say that the help obtained from local sources is better and more reliable than that brought from a distance.

There are many drawbacks to the profitable continuation of the present system of farming, but many farmers find it is hard to put these into words. They think there is something seriously wrong somewhere. They are not satisfied with the money they are making for the amount of work they do. It is a common complaint that small quantities of produce can not be marketed at a profit and the farmer can not obtain a higher price for a good article than for an inferior article in the local market. The farmers in the districts visited do not seem to take the marketing business enough into their own hands. This, I believe, is a question which should receive early and earnest attention.

The figures contained in the following table speak for themselves and show the actual conditions regarding certain points of the survey. The survey included a great deal more than these few points brought out:

	N. S.	P.E.I.	N.B.	Que.	Ont.	Man.	Sask.	Alta.
Number of farms	150	95	100	200	200	100	100	100
Average size of farm	216	112	255	166	146	407	388	448
Per cent. in grain	4	18	4	12	30	64	50	21
Per cent. in hoe crops	1	3	2	2	3	1	2	1
Per cent. hay and pasture	20	4	26	32	26	13	1	39
Systematic rotation	18	13	18	19	56	70	63	53
Using seed grain from own farm	60	72	74	69	80	76	86	79
Systematically selecting seed	3	.....	7	5		1	1	5
Keeping best part of field for seed	51	31	75	53		79	42	82
Cleaning seed grain	64	81	82	78	97	100	100	99
Cleaning seed grain with fanning mill	51	88	77	78	96	100	100	99
Treating seed grain for smut	4	11	.....	1.5	24	100	93	88
Saving own timothy seed	28	68	3	48	45	16	1	28
Saving own clover seed	3	27	.....	4	48	.....	.....	.....
Per cent. of grain sown seeded to clover	57	49	51	56	37	.09	.01	.....
Average lbs. per acre sown of red clover	6	2	6	3	6	12	10	.....
Average lbs. per acre sown of alsike	3	2	2	2	5	3	.....	9
Average lbs. per acre sown of timothy	11	8	11	8	5	5	9	6
Per cent. growing alfalfa	2	.....	2	5	20	8	9	13
Knowing names of varieties of grain sown	66	95	63	61	93	95	88	82
No care to prevent waste	45	84	31	67	93	100	100	100

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During 1912 eight illustration farms were established in various parts of Ontario. The districts in which these farms are located are those in which investigation work was carried on previous to 1913, the 1913 survey being conducted in districts hitherto unvisited by the Commission. The illustration farms are not owned or rented by the Commission, nor is the farmer paid a salary. He receives the advice of the Travelling Instructor, who visits him from time to time for the purpose of conference and discussion regarding the best system and methods to be followed on his farm for the purpose of improving the quality and quantity of the products of the farm while maintaining or increasing the fertility of the soil.

Among the various lines of work followed on the illustration farms are: The introduction of the best known varieties of grain of the best quality obtainable, registered, pedigreed seed grown by members of the Canadian Seed Growers' Association being used in most instances; the sowing of an adequate amount of clover seed per acre on a part of the farm for comparison with the part sown with the lesser amount generally sown by the farmer; the practising of after-harvest cultivation to kill weeds and to conserve moisture; the production and application of farmyard manure in the most economical and approved manner; the introduction of summer pasture mixtures; making use of labor-saving devices and machinery and the planning of rotation of crops which will suit the district and which will best utilize the available labor on the farm. No definite plan can be laid down which will be applicable to all districts, as each farm presents problems of a local nature which we are endeavoring to solve, after making a careful study of the conditions and needs in each particular locality.

I shall read part of a letter received from Mr. Will. C. Barrie, of Galt, which will show some of the work being conducted on his farm, and as an example of many others which are at my office:

"In comparing the plots sown with the different thicknesses of timothy, we find that the plot sown with six pounds to the acre has much the best stand, and should, from present appearances, yield a heavy crop of hay.

"The plot sown with two pounds per acre is much too thin and we notice a considerable number of weeds in that plot, while in the other plots that were sown thicker there are no weeds.

"Regarding the different seedings of clover we were rather doubtful at first as to the advisability of sowing in the fall, as it did not show up very well early in the spring, and we were under the impression that it had been mostly winter-killed. We bought enough clover seed then to resow the whole field with ten pounds per acre, sowing at the same time two acres of the field that had not been sown in the fall. During the summer we noticed that owing to the very dry weather there was practically no clover on the two acres that had been sown in the spring only, while on the rest of the field that had been seeded, both in the fall and the spring there was a splendid catch. I believe the reason we did not notice the clover in the spring was because the top dressing of manure had covered it, and in that way it was able to pull through the dry weather.

"The alsike, sown ten pounds to the acre, looks the best, although the lighter seeding shows up well, much better indeed than our best catch in another field that was sown in the spring. The only disadvantage with thick seedings of clover and timothy in the fall, is that it might tend to lighten the yield of wheat. It is quite possible that the extra yield of clover and timothy would more than repay the loss,

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if any, in the yield of wheat. We will be better able, after next year's hay harvest, to judge the different seedings.

"*Top Dressing with Manure.* We have tried top dressing with barnyard manure on wheat and meadows, and we are convinced that it gives much better results than the old way of ploughing down all the manure for hoed crops. It not only helps to bring the young clover and timothy through the winter, but we get the benefit of the manure the season it is applied, while with ploughing it all under it is not in a condition to help the crop to the same extent, and much of it is wasted, especially on the soil that we have in this district.

"*Different Thicknesses of Seeding Grain.* The only tests we made in that line this year were with oats and wheat. The quantities of oats sown were 1½, 2 and 2½ bushels per acre.

"From the appearance of the stooks after cutting, the part sown with 2 bushels seemed to be slightly the best. It was a little thicker on the ground, but was somewhat shorter in the straw than the 1½ bushel per acre. The part sown 2½ bushels per acre was very short, due no doubt to the dry season, and part being on a higher portion of land. As this has been an extra good fall for wheat, we are unable to tell any difference so far between the thick and the thin seeding.

"*After-harvest Cultivation.* I am very pleased to say that the after-harvest cultivation has given good results, with both the grain and roots.

"We cut and threshed separately two plots of oats of four acres each, the one plot having been ploughed in August and cultivated occasionally during the autumn, and then ploughed at the same time as the next plot, which had been left in sod and ploughed late in the fall. We weighed the grain from the two plots and found that the cultivated plot gave a yield of 180 bushels, and the uncultivated plot a yield of 120 bushels.

"A difference of 60 bushels at 50c. a bushel shows a gain of $30.00. Counting the cost of cultivating at $4.00 an acre, it would mean a total cost of $16.00 for the plot, and that amount deducted from the $30.00 shows a gain of $14.00.

"I believe that the difference in the profit from the two plots next year, working them alike will be almost as much, as the soil on the plot that was cultivated is in a much finer condition and almost free from weeds.

"*Roots.*—We had a little over 1¾ acres of sugar beets, 64 rows in all, 28 rows on the land that had been cultivated after harvest, and 36 on spring ploughed land. The whole field received a dressing of manure during the winter. The cheque from the sugar factory showed a weight of 19½ tons, and made a return of $108.80.

"We weighed the beets as we took them up and found that the 28 rows on the cultivated plot produced 10½ tons and the 36 rows produced 9 tons of clean beets. After measuring the plots and figuring up the weights we found that the cultivated land was producing sugar beets at the rate of 11 2-3 tons per acre, and the spring ploughing at the rate of 8 4-5 tons per acre. The difference would be 5,733 lbs., and this at $5.63 per ton (being the price we received,) would show a gain of $16.03 per acre, in favor of the after-harvest cultivation.

"*Mangolds.* We had three plots of mangolds, each plot being a little over an acre. In taking them up, we found that the *Tankard Cream Sugar Mangold* produced about 100 bushels more than either the Giant Red or the Yellow Globe.

"*Corn.* We planted the Wisconsin Number 7 at the same time that we

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planted the White Cap Yellow Dent and the Leaming. It made a more rapid growth, and at the time of cutting was more mature than the others. We weighed the corn from a certain number of rows from each plot, but, unfortunately, I have mislaid the figures, but I remember that the load from the Wisconsin Number 7 plot was much the heaviest. Some of our neighbors who were trying it for the first time were well pleased and intend sowing it again."

The farmers in many of the districts where the illustration farms are situated have formed themselves into local improvement associations and have repeatedly asked for winter meetings, and in order to meet these requests a set of slides has been prepared and arrangements made to give a series of illustrated addresses on the production, care and uses of manure; soil cultivation; clover growing, and the use of machinery on the farm.

A number of summer meetings were held on the illustration farms, when the neighbors were invited in to see and to discuss the work being done. The Travelling Instructors were present at these meetings to explain the work and to encourage the neighbors to adopt those methods which were found to be profitable and suitable to the district. It is expected that illustrated addresses will be given during this winter in each district in Ontario where an illustration farm is located.

A MEMBER: What is the size of these illustration farms?

MR. NUNNICK: We have no particular size for the farms; they would be of the average size for the district in which it is situated; not too small and not too big, because we could not follow or adopt methods on too large farms; we want just the average sized farm.

A MEMBER: I should like to ask if it is your intention to go over the whole Province of Ontario, township by township; what is the definite policy? So far you have just covered a few townships in this investigation work. Is it the intention to take the average of these townships as a basis for the work of the whole Province; or is it intended to survey the whole Province?

MR. NUNNICK: In the first place, we visited six counties; in two of the six counties we visited two districts; that makes eight districts in which we have established these station farms. The survey work in 1913 has been conducted in districts hitherto unvisited by a Commission. I will not say whether there will be illustration farms established in all districts, as I have no instructions to promise that they will be, but I think in all probability that sooner or later, I do not know when, this work will be taken over by the Province or the Dominion Government as part of the extension work of these departments. The survey work was conducted this year by request of the Honorable Martin Burrell, Minister of Agriculture for the Dominion.

PRINCIPLES OF CROP ROTATION.

H. A. MORGAN, B.S.A., KNOXVILLE, TENN.

I wish to express my very great pleasure in having the opportunity of returning to the institution from which I received so much inspiration as a student over twenty years ago. I wish especially to express my gratitude to President Creelman and Prof. Zavitz for the invitation to appear on the programme at this meeting.

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The subject of crop rotation is of universal application. From a lack of knowledge of the principles of rotation, farmers the world over have not experienced a thorough conviction as to the necessity of system in rotation. As a consequence practice has been indifferent, resulting in many instances in an increased cost of production, due to a decrease in soil fertility. Those of us with farm experience have seen fields and farms lowered in fertility by the single crop system, until it would cost more to regain profitable production than the profits amount to from the crops removed.

Farmers must, more and more, seek nature for guidance. Most of the problems experienced on the farm have been worked out by nature long before man possessed the land. The wise man Solomon said, "Go to the ant, thou sluggard, consider her ways and be wise." He meant nothing more than it is wise to seek natural laws and follow them. The immediate need in American agriculture is nitrogen. The air supply is inexhaustible. The logical and economical method of getting nitrogen is the introduction and maintenance of legumes in a judicious crop rotation, and a more generous use of live stock in our farm management plans.

Nitrogen is more liberally demanded by non-legumes, grasses, grains, etc., than phosphorus and potassium. Nitrogen is from three to four times as expensive on the commercial markets as the other elements, and thus it would appear that nature had planned legumes and rotations, to make ready for the varied conditions that now obtain on American farms. Under average conditions the nitrogen demanded by non-legumes should be put in the soil by the growing of legumes, supplemented by the feeding of these to live stock where practical, before the non-legumes were planted. It is not a wise farm practice to rob the virgin soil of its nitrogen, that nature has spent myriads of years in storing up one way or another, before legumes are seriously considered. Rotation is a necessity from the beginning, and where it is not practiced farms and communities have experienced agricultural grief, and rural life has been pillaged.

In summing up the first important reason for crop rotation let me emphasize the following outstanding facts. Our soils are weak in nitrogen, and plants demand greater amounts of this element than of others, and on commercial markets nitrogen is so expensive that in general farm practice no man, under present conditions, can afford to buy the amounts needed for profitable crop production and soil improvement. Let me repeat that we must go to nature, consider her ways and be wise.

Rotations have another mission. The utilizing of another great principle of nature, that of diversity. The different plants created are not the result of guess work. Some are deep feeders, others gather food near the surface. Whether this was planned for the good of the plant, the benefit of the soil, or to force the farmer into more economical lines of farm management I shall not stop here to discuss. The lesson is clear whether we take it from nature or from the experiences of an opposite practice.

Again rotation delivers another message, especially to those who live in areas of moderate or excessive rainfall. Erosion and the leaching of plant food have produced results more disastrous than soil robbing by the removal of successions of the same crop. We have not harkened to the call of nature "to go to grass" for the betterment of animal and the soil. We have not realized the loss of the growing season that exists many times, and with some crops in particular, between the time of harvest and the planting season. Nature's provision of a variety of crops, and our privilege of crop rotation will correct this loss

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which amounts in my own state to from twelve to fifteen per cent. of the growing season.

Still another vision which is only possible through the practice of crop rotation, is that it is the only cheap method of controlling weeds, insects, and disease. Crop rotation studiously planned makes bare fallow or summer fallow for the control of pests like the Canada thistle unnecessary. It is the single crop, or periodic succession of the same crop that encourages enemies of the farmer. It may be here stated that farm enemies are often found outside of the group of pests known as weeds, insects and diseases. Human pests in the form of directors of corporations thrive best where the single crop system obtains. The wheat, cotton, corn, and other markets bear important testimony to this fact. The Hessian fly, the grasshopper and other insects are better controlled by cultural systems than by insecticides. Crop rotation is fundamental in the best cultural systems now recommended for insect control. When we awaken to a realization of the education, training and experience that is demanded in the successful operation of a farm in this day and time, the control of plant diseases by better arranged cropping systems will be the general practice rather than the exception. My reason for the apparent indifference to these nature processes of preventing loss by various weeds, insects and diseases, is that the farmer has not yet come to his own, educationally, and that his visions are yet to come. The extension service represented in this Experimental Union is gradually clearing the agricultural horizon, and we are very hopeful for the agriculture of the near future.

In closing, I am not unmindful of the many other productions of crop rotation. Better markets, a better distribution of the work of the farm throughout the year, its encouragement to live stock development; and last, but by no means least, its power to create farm interest, to develop better rural life, to make happier homes, and to involuntarily tie the country boy and the country girl to the farm where manhood and womanhood are more easily and economically produced.

MR. W. J. SQUIRRELL: We have all, I am sure, appreciated Prof. Morgan's address. His suggestion on crop rotations should be of great value to all of us. The kind of rotation used by farmers in Ontario to-day depends more than ever before on the labor situation. The scarcity of labor has in some districts almost eliminated those crops, the growing of which require a large amount of labor, especially of hand labor. One of the points in Prof. Morgan's address that especially appealed to me was the advisability of always including clover or some other leguminous crop in our rotations. The plowing under of the whole of a leguminous crop, or even the roots of these plants, will go far in supplying the nitrogen necessary in soil fertility. Nitrogen is one of the most easily destroyed of all the soil elements, large amounts are leached away in the soil. It is one of the most costly of the soil constituents if it has to be purchased in the form of commercial fertilizers. Then why should the farmer not supply it more largely than he does in the form of green leguminous crops plowed under? There are many farmers in Ontario who could greatly increase the yielding capacity of their farms by plowing under such crops as these. Experiments conducted some years ago in the experimental field at Guelph in which winter wheat was sown on clover and on grass sod showed an increase in yield per acre of about 21 per cent. in the crop produced from the land where clover sod was plowed down. In the regular rotation in this same field the land is manured once in every four years with about twenty tons of barnyard manure per acre, and once in eight

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or ten years a green leguminous crop has been plowed down. No commercial fertilizers are used on this land, and yet in the average of the last five years of a twenty year period nearly all crops have shown an increase in yield per acre over the first five years of the twenty year period. Not only are there advantages of increased crop yields from the fertilizing constituents added by the green manures, but the humus content of the soil has been increased, its water holding capacity made greater, and the soil made more friable and easier to work.

CO-OPERATION IN AGRICULTURE.

C. F. Bailey, B.S.A., Assistant Deputy Minister of Agriculture, Toronto.

Co-operation in Germany owed its origin to the desolation left by the Seven Years' War, a century and a half ago. The country was left desolate by war, and as a means of restoring credit, which had been destroyed by war, the great land-owners were compelled by law to pool their holdings as a basis of credit for the revival of agriculture. From that time on, agricultural co-operation has thrived and German agriculture has become the best example of the possibilities of the soil. As an evidence of this fact, we find Germany, a country with comparatively poor soil, has doubled her yield per acre during the last twenty years, and with a population of 65,000,000, increasing at a rate of 1,000,000 per year, is able to produce 95 per cent. of her own foodstuffs.

In the beginning, when the great landlords were compelled to pool their property as a basis of credit, land mortgage bonds were issued on the basis of the property pooled.

The "Landschaft," or land mortgage bond, may be compared with our currency system. We are told that there is a dollar of gold behind every paper dollar issued, so that naturally we prefer the paper. So the Landschaft says there is a mortgage behind every bond it issues—a mortgage that has perhaps $2 worth of property behind every dollar it represents. Consequently the bond has a ready market, even though it commands a low rate of interest. In other words, the investor buys a land bond in Germany as we would buy a municipal or railway bond. One of the attractive principles of the Landschaft to the lender is the fact that it provides for the payment of a small portion of the principal each year for a long term of years, and at the end of the period the borrower has discharged the mortgage. For example, if a mortgage were to run for 54½ years, bearing 4 per cent. interest, and the borrower paid one-half per cent. each year on the principal in addition to the interest on the principal, at the end of 54½ years the debt would be discharged and the farmer would hardly have felt the payment. He would have to pay 4 per cent. interest anyway, and the additional one-half per cent. is scarcely felt.

As an indication of the marvellous development of mortgage credit institutions in Germany, I am going to give you a few figures showing the extent of the system. There are 17,000 co-operative long-time loan banks in operation, having a membership of 15,000,000 farmers, with an annual business of $1,500,000,000; outstanding loans of $500,000,000; savings deposits of $500,000,000; and current accounts of $500,000,000. In sixteen years only nineteen of these societies have been involved in bankruptcy, and it is supposed that no depositor ever lost a mark. The number of failures among commercial banking institutions in Germany was over fifty times as great as among the rural co-operative institutions during the same time.

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Short Time Credits.

So much for the long time credit banks. Now, just a few words on smaller or short time credit banks. These have been introduced in every state in Germany, and in fact in practically every country in Europe. In the year 1848, Germany experienced very hard times, and Wm. Raiffeisen, being moved to pity for the poor, organized a co-operative society for the distribution of bread and potatoes. The following year, he founded a loan society to support the unprovided farmers; its members were rich philanthropists who sold cattle to the unorganized farmers at easy rates. In 1862, he organized a third society, which went a step further—its membership being composed of the borrowing farmers themselves. This was the beginning of the great system of Raiffeisen banks in Germany, which has carried aid to millions of farmers and whose boast is that no man has ever lost a dollar.

A rather strange coincidence is the fact that during the same year, and under much the same conditions, a system of urban banks was established, known as the Schulze-Delitzsch banks. Both these banks were organized for the purpose of assisting the poorer class of the farming population, also the artisans, on collective security. The Raiffeisen banks limit their area to small communities in order that they may more conveniently regulate their loans; they insist on unlimited liability, and at first had no share capital; but when compelled by law to have share capital, they made it as low as possible—one share very seldom being over $1, and often as low as two cents. Those wishing to borrow present a written application for loans, stating specifically the purpose of the loan. In all cases it must of necessity be for productive purposes, and all loans are made at from three to twelve months at very reasonable rates of interest. Only the secretary of the Association is under salary—he being either the minister or a school teacher. They have no pretentious buildings, and usually meet in a tavern, store or some convenient place, once or twice a week to receive deposits or applications for loans. These small local organizations are federated, forming a central organization which acts as a clearing house, and in this way the money collected from non-borrowing societies is used by the borrowing societies. The funds of the association are deposited in some reliable bank, and where additional funds are needed they are obtained from these banks at reasonable rates. The Raiffeisen banks also carry on a buying and selling business. The Schulze-Delitzsch system, while primarily instituted to assist the artisans, has also in many cases materially assisted the farmers who are often members of the banks. These banks differ from the Raiffeisen banks in that they are not confined to small areas; have salaried officials, and do not federate for business, having federation for educational purposes only.

While banking has played an important part in the development of co-operation in Germany, there are many other organizations working in the interests of the farmers: co-operative stores, elevators, creameries, supply societies, breeding societies, insurance, and many others are in evidence.

Co-operation in Denmark.

There is probably no more striking example of what co-operation may do for agriculture than what has been accomplished in Denmark. Denmark undoubtedly is the most highly-organized country in Europe for co-operative production and distribution. Thirty years ago she was practically bankrupt, a land

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of sand dunes, yet to-day her wealth per capita is higher than any other European country. It is estimated that there are not more than 2,000,000 farmers in Denmark, yet there are 8,000,000 members of co-operative associations. In other words, the average farmer is a member of from five to ten co-operative associations. The country is so thoroughly organized and controlled by the farmers that it is practically the only medium through which the farmers can do business. The following is a list showing the variety of co-operative associations: Dairies, bacon curing societies or abattoirs, societies for purchase of requirements, societies for cattle export, societies for egg export, societies for horse breeding, societies for cattle breeding, societies for pig breeding, societies for sheep breeding, control societies, wholesale societies and co-operative stores.

Co-operation in Ireland.

In Ireland we have an example of a more recent development of the co-operative movement. The Irish farmer found himself in competition with the farmers of the better organized European countries, and was being practically driven out of the market. The masses of people in the manufacturing cities required that food should be of uniform quality, and this could not be accomplished unless the farmers were organized. In many cases they had the experience of being beaten in the English and even in the Irish markets for such commodities as butter, bacon and eggs, for the production of which Ireland is specially favored. The real beginning of co-operation was at a time when the industry was going through what might be termed an industrial revolution—the old home methods being supplanted by the factory method—but unfortunately the factories were controlled by outside capitalists. These men were under no obligation to the farmers and gave little encouragement for improved methods.

The first attempt to organize dairies was on the ordinary joint stock plan; these companies all broke down because the system is not suitable to a farmers' industry. However, under less favorable conditions, creameries were organized on the co-operative system, upon the ruins of the joint-stock companies, and at the present time are producing $10,000,000 worth of butter yearly, and these give entire control of the profits to the farmers themselves. To-day, there are approximately 100,000 farmers in Ireland members of co-operative associations, representing 500,000 of the population. In Tipperary there are between 3,000 and 4,000 small farmers engaged in conducting a co-operative bacon factory, while in Wexford a similar co-operative establishment is being cautiously undertaken. Many other societies, such as co-operative stores (wholesale or retail), machine societies and credit societies are doing equally flourishing business. The total business transactions of the co-operative movement in Ireland for 1913 would aggregate roughly $15,000,000.

Co-operation in General.

While it will be found that the rules governing co-operative societies are varied to meet conditions, yet it is true that there are certain underlying principles which spell success or failure for any co-operative organization. Co-operation, as Sir Horace Plunkett has so aptly said, is organized self-help. In other words, a co-operative organization assists the farmers to help themselves and depend on their own resourcefulness. It would appear that many people do not appreciate the difference between a joint stock company and a purely co-operative association. In many instances, where the shares of a joint stock company are held by farmers.

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it is generally looked upon as a co-operative association. The first and main difference between these two organizations is that every share of stock in a joint stock company commands a vote, whereas the truly co-operative association insists upon one man, one vote. In other words, the co-operative association is a union of men rather than a union of money units. The success of a co-operative association should never be judged by its profits. They are not profit-seeking organizations, but rather organizations serving in the best interests of its members. Where there is a share capital, instead of paying the profits on a basis of the number of shares held, only the ruling rate of interest is paid and the balance is divided, one part to go towards building up a reserve fund, and the remainder distributed among the members in proportion to the business done through the association. In many instances, in order to encourage efficiency in the organization, a certain percentage of the profits is divided among the officials. In all co-operative organizations too much stress cannot be laid upon efficient management. The manager must be imbued with the true co-operative spirit, and above all things have a thorough business training and be well fitted for the work in hand. Too often this fact has not been appreciated by farmers, and an association has failed to succeed through the selection of men unfitted for the work or under-salaried. Co-operation in Europe has made possible the standardization of farmers' products—the Danish farmer has won his reputation in the English market simply by maintaining the standards set in the various grades, and the house-wife, knowing this, can always be sure of getting her money's worth. Similarly, Ireland, only a few years ago, was unable to compete with other countries, both at home and abroad, but through the development of co-operative associations she has built up the standard of her products and is again making for herself a name to be reckoned with in the British market.

Our Weakness in Ontario.

I mention this chiefly because I feel that it is one of the greatest weaknesses in our methods of marketing in Ontario; too often we find the fruit in the first and second layers of our box or barrel excellent in quality, and the balance very indifferent. Even in many of our co-operative associations, where we might hope to expect a better appreciation of the advantages of winning the confidence of the consumer and making a reputation for the association, we find that too little consideration is given to the question of quality. Until this all important feature is more thoroughly recognized, we cannot hope for Ontario to have the place she deserves in the markets of the world. Then there is the question of disloyalty of members to their association which must be reckoned with. Almost all newly-organized associations are inevitably met with competition. This is particularly true with selling societies. When the members are offered better terms than they can secure through the society, they accept the bait, thus lessening the strength of the organization and perhaps ruining its possibilities for success. If in union there is strength, most certainly in division lies the greatest weakness.

How Loyalty is Enforced in Europe.

In most countries in Europe this is guarded against by requiring the members to transact all their business through the association, or by fines where a member fails to fulfil his contract with the society, and indeed in some countries the law compels each member to do business through the society of which he is a member. Almost without exception, co-operative societies in Europe are organized

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for special purposes. It may be for the purchase of supplies, selling eggs, insurance of live stock against disease, creameries, etc. Occasionally it may be found advisable to have societies organized for more than one special purpose, but should never be attempted during the early development of the society. These separate organizations are usually federated and form a central organization for the purpose of disseminating knowledge along co-operative lines, supplying corps of auditors and instructors to examine the books of the local branches, and having a general supervision of the business methods of all the local organizations.

Has Elevated the General Standard.

Apart from the mercenary aspect of co-operation in all its forms, we cannot evade the point that co-operation has been a great factor in building up the social and moral standard of rural Europe. It has been the means of developing a community spirit—something that is lacking in many sections of this Province of Ontario. Farmers of Ontario have cultivated an independence and self-reliance that is to be admired, but too little attention is given to the district in which they live. We are too much inclined to consider our immediate surroundings, and have failed to grasp the importance of considering the community as a whole. Community interest means the common interest of all; so let us take the European co-operative motto: "Each for all, and all for each."

Co-operation in Ontario.

Although co-operation is merely beginning in Ontario, I want to draw your attention to the work which has been accomplished by some of our associations. We have at present 52 fruit growers' associations. These associations have done a great deal towards putting the fruit growing industry on a more satisfactory basis, and there is evidence of further development of this form of co-operation. Last year a central selling organization was formed and a number of the local associations participated. This is a very important movement, and it is to be hoped that every fruit growers' association in Ontario will become a member of the federation.

Example from New Ontario.

The Rainy River Co-operative Potato Growers' Association is an example of a society which has undertaken to sell all the products of the farm. It is composed of six local societies, representing six points on the C. N. R., has a manager working on a 5 per cent. commission basis, who is under $5,000 bonds, and the association has a line of credit for $2,000. For the first year's business, the success has been phenomenal; all the products of the farm have been disposed of co-operatively at prices away ahead of any previous year. So encouraging has all this been that the society is getting voluntary members, and outside communities are seeking admission. A similar organization worthy of note is the Chatsworth Marketing Association, in Grey County. Some thirty progressive farmers in that district organized for the sale of their farm products, opened a central grading station in Chatsworth, and have had a traveller soliciting orders from the retail stores in Toronto, with excellent results. Only recently this association opened a wholesale and retail store in the city of Toronto, and it is to be hoped that this association will receive encouragement and that other local societies will federate with it, so that its development may not be retarded through lack of capital.

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Co-operative Egg Circles.

The co-operative egg circles of Ontario have been organized in several counties, more particularly in Ontario County, and have been the means of arousing much deeper interest in poultry raising, as well as enabling the farmers to secure a higher price for their eggs. Here is one example of the effect of standardization; all the eggs are stamped and the members are required to market good eggs.

A number of Farmers' Clubs have made some efforts along co-operative lines, particularly in the purchase of cattle feeds, fertilizers and seed grain. Probably the most outstanding club is the one at Williamstown. During the past year the members have purchased $31,000 worth of feed, and the prospects are their business will be doubled this year.

The Beekeepers' Association, Vegetable Growers' Association, and similar organizations have under consideration schemes for developing co-operative societies for buying and selling. Co-operation is developing along several other lines, and with the support of all the farmers and the aid of the new branch of co-operation and markets which has recently been established, we hope to see this movement growing and branching out in many other districts.

We have a progressive and intelligent class of farmers in this Province, and when they thoroughly understand and appreciate the advantages of co-operation, I look for a development that may perhaps be slow in the beginning, but built upon a foundation of sound business principles, will gradually result in better farming, better business, and better living.

Prof. Morgan: Mr. Chairman, Ladies and Gentlemen,—Mr. Bailey gave you an outline of the progress of co-operative rural credit in Europe as he saw it last summer. For a few moments I shall discuss the application of the European Co-operation and rural credit condition to Ontario and the United States. It will be very difficult to transfer the European systems to America without modification or unless sufficient preparation be made in this country for their application. Security is the basis of any liberal credit system. Whenever expensive investigations have to be made before money is loaned, the expenses are paid by the interest charged. Our agricultural population is less dense and more transient than in Europe. Our land values shift to some extent with the floating population, and hence conditions are unstable and loans less secure. Agriculture in America is not the unmixed business it is in Europe. Our farms are held and operated for their real estate interest as well as for their productive value. In Europe land has assumed more permanent values and farmers are more dependent upon soil fertility and the actual making of livings from the earth than we are here. There, too, the question of land titles is practically settled. In Europe the owners are guaranteed by the Government and in case of sale the charge of transfer is small. In Europe all the people accept the prosperity of the farmer as fundamental in the uplift and material advancement of the nation, and his interests are constantly safe-guarded by the sentiments of all of the people and legislation local and national. Assessed values of lands are their approximate values, and under such a system it is less expensive to secure loans. What I have said is a digest of the comparison of conditions in Europe and America with reference to rural credits and from this we may realize that many changes will have to be made in this country and much time will elapse before we can transfer bodily the rural credit system which is doing so much for European farmers.

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Co-operation is the handmaid of rural credit and the spirit which pervades Europe with reference to this movement has not been a mushroom growth, but the outcome of conditions which in America we are only beginning to experience. with practically no more new and fertile areas to migrate to, our "settling" period has about arrived, and the next decade or two will mean much to American agriculture. It is gratifying to know that we are about to profit from the varied experiences of European countries which have gone the way we are now travelling, and that the best thought of this country will endeavor to prevent local, provincial, state and national agricultural mishaps that have come to the older sections of Europe.

When our lands were virgin and the population less numerous our products sought markets across the waters and forced the co-operation of farmers and the development of credit systems in self-defence. The result of co-operation and credit was soil improvement, increased production at lower cost, and a more rational and logical system of marketing. Farmers became business men, and by means of better and cheaper means of soil improvement, production and marketing, due to co-operation of every description, the European farmer soon met American competition, and to-day is not only maintaining his home market, but is actually finding America a profitable market for surplus products.

We have wasted our soil in riotous ignorance. Europeans have found us an easy mark for the purchase of materials carrying high percentages of soil fertility. Through their co-operative organizations they are able to purchase our phosphates, manufacture them into available forms and sell them to their farmers below the cost of the same products in the communities from which they imported the raw materials. Through co-operative systems the farmers of Europe are enabled to finish in the bacon factories, the cheese factories, and other ways the raw into the finished products of the farm, thus multiplying their market facilities on the farm for raw products and conserving every available factor of soil fertility for future production.

From what has been learned of European systems of agricultural progress, it seems clear that we must engage through our College of Agriculture in a campaign of education in this country before the lessons of these older countries can be applied here. Economics as applied to rural development must form an important part of the curriculum and the Extension Service now so prominent in this country. Our colleges and schools must teach lessons of co-operation in credit, production and marketing until the entire farming population is not only familiar with the principles underlying such movements, but until they form a definite part of successful business organizations of rural communities.

J. Lockie Wilson: I think the keynote has been struck. I know of a case in one village of about 700 people, in my own county, where over $200,000 of farmers' money has gone out West to buy town lots. This matter, I think, is well worthy of consideration. Perhaps just in this connection you will allow me to say there is a very important question connected with co-operation to be dealt with in the earlier stages of the game, and that is the railway transportation problem. This problem must be dealt with by our Governments or by the Board of Railways Commissioners. Why are goods carried to Australia, some 10,000 or 11,000 miles, for one dollar per one hundred pounds, while the farmer in our own vicinity shipping from our county to, say, North Bay, is charged seventy-five cents per one hundred pounds? And, again, another that might be worthy of consideration is this: How is it that wheat products from Saskatchewan or Alberta.

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shipped some 700 miles to Port Arthur, run from the cars into elevators, from the elevators into the steamship, hauled by the steamers to the lake terminals at this end and again transferred into elevators; then run out of the elevators into freight cars and hauled to Montreal, again transferred into elevators and from the elevators run into the steamers to make a 3,000 mile journey across the ocean to Liverpool, where the wheat is ground into flour, shipped to London and made into bread and sold at one and three-quarter cents per pound, while in Toronto the price of bread is four cents per pound? This is of vital importance and pertinent to the question of co-operation.

MR. LEDREW: I do not know whether to be encouraged or discouraged by what Prof. Morgan has said about co-operation, and the chances of bringing co-operation to a working basis in this Province. I am afraid that if we have to wait until our land system gets into such a condition that exploitation will not take place, it will be a long time before we get going in co-operation; but I am satisfied, nevertheless, that it is the proper goal to aim at, whether we get there or not. The last speaker mentioned the prospect which Mr. Hart has ahead of him as being a difficult one. I know it is not easy, but I think if we knew the man thoroughly he would not be so doubtful about the prospect as he is at the present time. We have a good man for the work; a man who is not going to shirk his duty; who will be indefatigable in the exercise of that duty, and if there is a man in the Province of Ontario to-day who can work it out, I think it is the man that the Assistant Deputy Minister of Agriculture has selected. It is all uphill work, of course, to do anything in the line of co-operation, for the simple reason that practically the whole Province must be educated to it. I had an opportunity of making a study of co-operation at close range three or four years ago in Denmark, and I may say it was brought about there simply because the farmer saw in it safe returns in British gold. I do not think the farmers of this country are any more pig-headed than those of other countries, but the farmers of Ontario, like other farmers, want to see a definite plan of co-operation laid out before them, and this, I think, can only be accomplished by a campaign of education. I think the scheme that the Deputy Minister has in mind is something of this nature. There is only one way in which a Government can assist co-operation. If money is spent by way of a direct grant I think it would be worse than useless so far as co-operation is concerned. To my mind, if a great many of our Government grants—I know I am treading on dangerous ground—were spent on education and teaching the people how to accomplish the objects sought themselves it would be a great deal better than direct gifts of money. From my point of view I cannot emphasize that too strongly. I would like to see the Government establish a bureau for distributing among the farmers of the country all the information that can be given them on this subject; that, I think, is the true and only way.

In regard to rural credit, here again we strike a very difficult point. It is like the Irishman with the boots: you have to wear them a week before you can get them on. I think that every country in the world that has tried agricultural co-operation, certainly every one that I have visited, has come to the conclusion that the real starting-point of co-operation is at agricultural credit. Therefore, the common practice has been to organize in that line which was nearest at hand, and work back towards agricultural credit. It seems to me we should make an effort to start right so that we may not have to go back. Never-

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theless, if the people in favor of co-operation would get busy and organize, with the assistance of the Department of Agriculture, I think it would not be very long, provided we organize properly, before we could have both our co-operative and rural credit associations on a substantial footing.

There is scarcely a branch of the whole agricultural industry to which co-operation does not lend itself, and I think there is an opportunity to go ahead with the land system we have until we are satisfied that the other system would be better.

W. J. LENNOX: Mr. Chairman, Ladies and Gentlemen,—I do not intend to take up very much of your time this afternoon on this particular subject. I was glad to have the opportunity of being here and listening to Prof. Morgan, Mr. Bailey, Mr. LeDrew, and the others who will follow me on this subject. Thinking over this question from time to time in our work in connection with the Seed Branch, in the production of seed grain, and in the marketing of this particular product, I have thought of many ideas in connection with the subject. I was glad when the previous speakers referred to the matter of quality in products; that is one of the things that sooner or later must come in our work. We have organized what we call clubs or seed centres, which means banding the farmers together for the production of seed grain, with the view of getting a better quality of products. You may say, how does that affect co-operation? I think all the gentlemen present are familiar with the work of other organizations that are interested in the improvement of seed grain. Take, for instance, the improvement of seed corn, a man selects a number of good ears of corn and plants the seed of these each year with the idea of selecting from that plot seed for the following year, and so on until he eventually gets a better stand, a better class of corn, a corn that will produce more bushels per acre, and of a decidedly better quality. Now, in banding the farmers together for the production of this particular crop, the idea is to have one farmer do the work of selection. We are doing this in some of the clubs already organized, some of which have seven members only. That is a small membership, but on looking back over the work that has been done in other lines I have seen great results from small beginnings. The members of these clubs have nominated one member as the present seed selector, who takes the responsibility of selecting seed for the whole community. The seed is divided among these members, consequently, a uniform quality of product has been produced from that locality. This may not seem to some of you of as much importance as it does to me, but I recognize that the encouragement of better seed is resulting in a better product being produced in that particular locality. These illustrations come from the corn district, but the fact is, that conditions as they exist in the corn country are the same throughout the whole Province. I was pleased to hear one of the previous speakers refer to intelligent education among the farmers. For instance, in the case of clovers and grasses, we find the farmers have little idea, generally, of what should be cultivated, and they have less idea of the impurities which are usually contained in that particular product. It seems to me that through co-operation, in growing clovers and grasses, we will have increased interest, and through that increased interest resulting from co-operation we will have education. In this way the farmers would derive benefits which would never be derived by going around the country lecturing upon the qualities and varieties of grains. We are endeavoring in our branch to establish these seed centres all over the Province.

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This is a beginning of the seed production market which must come later. There will be a market for the best quality of grain if we can produce the quality.

GEO. ROBERTSON: It is a long time since I left the college here, and the longer I am away the more I realize how little I know. That is certainly true of my knowledge of co-operation. When I think of co-operation, and of the wonderful things it is going to do, if adopted, I am reminded of one thing I learned before I went to school, and that is, while you may lead a horse to water you cannot make him drink. The trouble with co-operation, it seems to me, is that the horse won't drink. How are you going to make him drink? Success in anything means that if you tackle the subject and do not at first succeed you have to tackle it again. We have a Fruit Growers' Co-operative Association in the Niagara district which has met with a certain measure of success. It has also met with a certain measure of failure. When did it start? Why did it start? When I left College here in 1895 and went down to the Niagara Peninsula to start as a fruit grower the methods employed in raising fruit were not as they are now. Peaches and the tender fruits were then our big crop. If a kindly nature smiled on us, and weather conditions were right we had a crop of peaches; if weather conditions were wrong we had a leaf curl, which meant that the leaves dropped off the tree and the energy of the tree which should have been spent in developing fruit was required to replenish the leaves, and in the meantime the fruit dropped. In a late spring, followed by hot weather, we had a good crop; that is, one hundred per cent. good. Peaches were $1.50 per basket, and netted us about 50 cents under these conditions. Then along came the San José Scale. At that time I thought co-operation would be the solution of our problems, and when I suggested this my friends thought I was fit for the Hamilton Asylum. When we improved our methods we got better crops, but we had a limited market which could not stand an over-production, and it was only under these conditions that we got down to where we were able to form a co-operative association. It was fairly successful at first. I remember the first meeting, when we started the co-operative association. We met in a little office, sat around on barrels and empty tomato crates, and discussed where and how we were to reach out for better markets. We decided the only way was to ship in carload lots, and to guarantee a full car to our customers every member had to pledge himself, and consider himself personally responsible for putting in so many baskets of fruit when a certain car was being filled. If he could not do this himself then he had to hunt some one who could, in order that freight rates might be reduced. We were fairly successful until our membership increased, and then the regulations were changed, so that we did not have to guarantee anything. There were other buyers from the same market, and the weak members left us. They sold their fruit where they could, and when they could not get a good price for it they asked us to sell it. That is one result which came from our co-operation. I quite agree with Professor McCready in saying that if you wish to educate the agricultural classes you have to start right down in the lower grades of the rural schools. A farmer who is independent, has fruit trees all of which are in good shape, has a complete water system, and large spray pumps of his own is not keen on co-operative associations. Co-operative associations can make that all possible to the smaller and less fortunately placed grower. It can supply spray pumps for its patrons, and other necessities that might be too costly for the individual small grower to buy.

F. C. HART: I will take up your time for only a few moments and try to sum

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up in a few words what we have gathered together from the discussion on co-operation. As director of the new branch of agriculture that has been opened by the Provincial Government, upon our shoulders rest the burden of the high cost of living problem. The burden does not rest very heavily personally because I am not very much concerned with the consumer, as I am supposed to be concerned more with the producer—the farmer—and in the new branch that we are opening it will be our subject to help the farmer to market his goods, keeping control of them until they get to the consumer, to a larger extent than they are doing at the present time. As it is they get beyond his control, and the other people who are interested, instead of helping the farmer to control his market to a certain extent, more or less destroy his market. The object of the new branch is not so much to find new markets for the farmer, but to control the freight and express rates, and all that sort of thing, all of which are necessary and essential for the proper marketing of his crops; and to place the farmer in shape where he will be able to control these things for himself. I am one of those who believe it is quite possible for a Government to over-assist any industry in the country. The industry of farming particularly lays itself open to over-help on the part of the Government because the farm is so intimately connected with all our lives. So everybody is calling upon the Government to help the farmer. When that is carried to an extreme, and I dare say it is approaching that state now in the Province of Ontario, the farmer falls into a more or less helpless condition, and is always expecting the Government to do this, or that. What we should do is to place the people in such a condition that they will be independent of Government assistance. We should help the people to do these things for themselves; and that is, to my mind, the proper solution of so many of these problems which at present confront our farmers. That will enable him to start his own co-operative societies; to organize for a rural credit system; to get his insurance rates reduced; to get freight and express rates reduced, and so on, all through the list of subjects we have discussed this afternoon.

In connection with the detailed work of the new branch, we will be glad to give any advice we can if you will communicate with us, and any suggestions you have to make will be cheerfully accepted. It would be impossible for me to lay before you, in detail, the large scheme we intend to carry out. If we do not live up to our responsibilities you will be disappointed. I would like to thank Professor Morgan for his influence in having a chair of political economy established here, of which Mr. LeDrew is in charge. Mr. LeDrew's work among the student body of this institution this last few years has made the dissemination of sound ideas in regard to agricultural co-operation possible, and the young men from this institution have gone all through Ontario, and to other parts of the Dominion, and that work has in this way prepared the ground for further work along co-operative lines. We have large markets right in Ontario to-day, and in that regard we are not at all behind. As has been said this afternoon, earlier in the programme, the Experimental Union started with eight members, and one can see the progress it has made in the years that have passed since its organization. It had a small beginning, and the same will be true with co-operation, as with all agricultural movements in the interests of any community. It will not accomplish its best until the people are imbued with the proper ideas, and thoroughly ready for the proposition, then when the horse is led to the water he will drink. Before I sit down I would like to say again, to any of the young

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men who are acquainted with organizations in their districts, or anywhere in the Province of Ontario, for the benefit of agriculture, we would like to have the particulars of these societies for our new branch. If you will kindly write me a letter telling what they are doing, you will in this way benefit the whole Province. We want the help of all the agricultural students, and the members of this Ontario Experimental Union, in the development of this new branch of the Agricultural Department.

THE DAIRY SHORTHORN.

PROF. G. E. DAY, O.A.C., GUELPH.

Any person who has studied at first hand the cattle of Great Britain will be impressed with the fact that the Dairy Shorthorn holds an extremely important place in that country, in fact, Shorthorns outnumber any other breed on the dairy farms of England, and it is stated that at least ninety per cent. of the milk which supplies the city of London is Shorthorn milk. The largest dairy farm which it was our privilege to visit in England, belongs to Messrs. J. and H. Robinson in Sussex. This farm has a contract to supply the city of Brighton with 500 gallons of milk per day, and they have nothing but Shorthorn cattle in their herds. It is true that they are not all registered Shorthorns, but they are essentially Shorthorns for all that, and a very large number of them are pure-bred. There can be no doubt, therefore, that the Dairy Shorthorn is a very prominent dairy breed.

Many of the Shorthorns in England are what we call "short pedigreed," that is to say, the first recorded cow has been admitted to registration in the English Herd Book since Volume 40 of that Herd Book was published. These cattle will not record in our Canadian Book, and the purchaser of Dairy Shorthorns must be on his guard if he wishes to buy cattle which will be eligible for registration in our Dominion Shorthorn Herd Book. Very many Dairy Shorthorns, however, and some of the largest producers, have as long pedigrees as any Shorthorn cattle in existence, and it is an interesting fact that the most popular Dairy Shorthorns of the present day almost invariably trace to the herd of Thomas Bates. Those who are familiar with Shorthorn history will no doubt remember that Bates was a man who attached a very high value to the milking qualities of his cattle, though he did not pretend to be breeding dairy cattle. His competitors used to think that Bates attached unnecessary importance to this quality, and the breeders of the so-called Scotch Shorthorn, which eventually eclipsed Bates cattle in popularity, paid practically no attention to milk production, except in a very few cases. The result is that Scotch Shorthorns are not popular in England to-day, and breeders are paying very high prices for Shorthorns which trace more or less directly to a Bates foundation. The old Bates tribes, such as Barrington, Cambridge Rose, Darlington, Duchess, Furbelow, Foggathorpe, Oxford, Waterloo, Wild Eyes, and many others which had for years sunk into comparative obscurity, have once more come to the front in England, and their representatives are probably the highest priced cattle in England to-day.

It must not be concluded, however, that the ability to give milk in profitable quantities is confined to the Bates tribes, but we find cows of practically straight Scotch breeding which would make very profitable dairy cows, if the owners saw fit to develop them along those lines. A personal experience will illustrate this

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point. Some years ago the College owned an imported Scotch bred cow belonging to the Roan Lady family. This cow nursed her first two calves, which every person will admit was very bad training for a heifer in the way of developing her milking qualities. With her third calf she was milked, and a record kept of her production. In the year she produced over 6,000 pounds of milk and there is little doubt that if this cow had been milked from the start, she would have made a really profitable dairy cow. This is only one instance, but it can be demonstrated very easily that there are many other cows of similar breeding which could pay their way in milk. It is also worthy of note that the third calf from the cow mentioned above was fitted and shown in the yearling steer class at the West Toronto Exhibition, where he was an easy winner in his class and was a very close runner-up for the championship of the show.

In general appearance the Dairy Shorthorn is somewhat different from what is regarded as the ideal beef type. We are liable to forget that a deep-milking cow will usually become thin, and we expect a heavy milker to look just as well as one which does not give enough milk to properly nourish her calf. If we stop to consider, we must admit that all cattle which are very thin look very much alike so far as conformation is concerned. If we were to take a prize-winning bullock in a fat stock show and starve it until it became extremely thin, we would be surprised to see how angular it would become. You would find that the broad back would become narrow and sharp, and the wide shoulder top would contract to less than half of its previous width. The full neck-vein would shrink and practically disappear, thus adding to the length of the neck, and the animal in general angularity of appearance would approach fairly closely to the general conformation of the dairy cow. In judging the type of a Dairy Shorthorn we must learn to make allowance for the lack of fat in the heavy milking cow, and many of these angular, thin cows, if allowed to go dry and fed liberally would eventually approach very closely to the standard beef type. Generally speaking, however, there is a difference between the general type of the Dairy Shorthorn and that of the strictly beef Shorthorn. The Dairy Shorthorn is usually a little longer in the face, somewhat longer in the neck, slightly longer in the leg, and rather more angular in her general conformation than the approved standard would permit. In other words, she is a little more nearly like the old-fashioned Bates cattle than the present Scotch type. While this is true, we must admit that the old-fashioned Bates cow was an extremely useful animal for beef purposes in spite of the fact that she did not exactly conform to the ideal beef form as we regard it to-day.

Unfortunately, I have not been able to procure any satisfactory records regarding the steers from Dairy Shorthorns, though I saw many steers from these cows which those of us who buy steers for feeding would be delighted to get. They might not make show animals, but they would make profitable feeders and profitable killers.

As to milk production, it is easier to obtain records, though until recent years the records in England may be regarded as private records, hence not quite so satisfactory as records which are made under strict supervision. Steps have been taken in England to have this matter more carefully supervised. Being what we call a "dual-purpose" breed, we would naturally not expect to find any world's records in milk production among Shorthorns, but we would expect to find such records as would qualify the breed to be classed as a profitable dairy breed. Of individual records one of the best is that of the cow known as Darlington Cranford 5th. Her highest yearly record was 12,567 pounds of milk, a record which has been beaten

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by many other Shorthorn cows for one year's production, but this remarkable cow produced over 100,000 pounds of milk in ten consecutive years, a record which places her among the really high-class dairy cows. Another remarkable record is that of Darlington Cranford 6th, who produced 62,467 pounds of milk in five consecutive years, or an average of 12,493 pounds per year. The late George Taylor publishing the records of 32 cows which he offered for sale in May, 1911. The 32 head averaged 10,032 pounds of milk per year each, and it is claimed that this quantity did not include milk given for the first two months after calving. The Tring Park herd of Shorthorns is one of the prominent herds in England to-day, and the management has the reputation of conducting absolutely accurate records. In 1911, 74 Shorthorn cows, which included all the Shorthorns which had been in the herd during the whole year, averaged 6,058 pounds per cow. Considering the number of cows included in this average, we must admit that it is a very creditable one from a dairy standpoint. The highest record was 12,851 pounds of milk. One cow averaged 9,723 pounds of milk for 8 years; another cow averaged 8,675 pounds per year for seven years, and a third cow averaged 7,124 pounds per year for eleven years.

The facts given above should be sufficient to establish the right of the Dairy Shorthorn to be classed as a "dual-purpose" breed. Many other records might be given, but sufficient has been said to demonstrate the fact that the Shorthorn is capable of giving a good account of itself both in milk and in beef.

There are many who doubt the advisability of attempting to develop the Dairy Shorthorn in Canada. We must remember, however, that the Dairy Shorthorn does not come directly into competition for public favor with the recognized dairy breeds, for the reason that the Shorthorn is not regarded as a special dairy breed and consequently cannot be reasonably expected to give a maximum production of milk or butter. We certainly would not advise those farmers who are making a specialty of dairying, to take up the Dairy Shorthorn, but there are many farmers in Ontario who do not wish, or who do not find it practicable to make a specialty of dairying, and it is to this class of farmers that the Dairy Shorthorn will especially appeal, for the reason that she will pay her way in milk and produce a calf which it is profitable to raise for beef production.

The greatest difficulty in connection with the development of Dairy Shorthorns is their comparative scarcity. It is true that they exist in rather large numbers in England, but the demand from other countries, as well as the demand at home, far exceeds the supply, and the result is that these cattle, especially females, cannot be bought in England to-day for what they are worth. It seems, therefore, that in the meantime at least, there is only one thing to do, and that is to make the best of what we have. There are many excellent milking Shorthorns in this country already, if they could only be sifted out and their merits recognized. The present move of the Dominion Shorthorn Breeders' Association in establishing a record of merit for milk production should bring in the course of time a lot of good cows to the front, and as time goes on it will be possible for those who are interested in Dairy Shorthorns to make selections of bulls from large producing dams, and in this way develop the milking qualities of their herds. It will no doubt take years to bring the Dairy Shorthorn into prominence in this country, but the persistent use of bulls from deep-milking dams and the careful selection of breeding stock, will work wonders in the development of dairy qualities in the Shorthorn cattle of this country. What will be the ultimate position taken by the Dairy Shorthorn in this country remains to be seen, but the breeders of Shorthorn

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cattle have it in their power to develop a "dual-purpose" breed of great possibilities, provided they see fit to do so. The whole matter now rests in the hands of the Shorthorn breeders.

MR. BAILEY: Mr. Chairman, and gentlemen, Professor Day has covered this subject so thoroughly that I feel there is very little left to be said. When we were listening to Prof. Morgan's address on his travels through Europe, you remember one film that was thrown on the screen which showed a herd of seventy-five cattle in Germany. That is the breed of cattle which is recognized in Germany, and practically all over Europe, as the triple purpose cow. Now, as Prof. Day has said, there are a great many people to-day in Ontario who have very grave doubts as to the possibility of developing a dual purpose cow. This triple purpose cow is one that will produce a steer which is able to do good work on the farm, produce a fairly good steer for beef, and is a cow that will give a fairly good flow of milk, so that they have gone one better than we are doing to-day with the dual purpose cow. It is a fact that in almost every line of business to-day people are specializing. We have sections of Ontario that are admirably suited to dairying, and I agree with Prof. Day that it would be absolute folly to think of going into a district of that kind and advising these people to go in for a milking Shorthorn, or any other particular breed apart from possibly the Holstein and Ayrshire cows. But, as Professor Day has said, there are districts in New Ontario where the farmers are doomed to breed beef cattle, and in my estimation these animals are not producing as large a flow of milk as they should. It seems to me if we could interest the people in the possibilities of milk production in the Shorthorn cow, from strains that were known to have milk behind them, we would do a great deal for the farmers of Ontario. I have been attempting to establish a herd of milking Shorthorns at our Government farm in Monteith, in the Temiskaming country. A year ago last August I purchased a couple of Shorthorn Cows, studied them carefully and it looked as though they could give milk, as there was indications of it. These cows came in a year ago last November, and they both gave between 6,000 and 7,000 pounds of milk with just the ordinary feed; they were not forced in any sense of the word. It is the intention of our Department to get together a herd of seven of that description, and with the use of a bull, that we have imported from England this year, develop a herd of milking Shorthorns from the stock that we will pick out through this breeding. As a matter of fact I am shipping two more cows to-morrow morning for this farm. Now why have we undertaken to develop a milking Shorthorn strain of cattle up in this new country? About two years ago I conceived the idea that the settlers in the newer sections of Ontario needed some assistance, in the way of supplying them with pure bred male animals, in order to control and accommodate the stock of that great country and I was successful in getting a small portion of the Federal grant to purchase pure bred males. We decided on the scheme of organizing Live Stock Improvement Associations in all the different settlements throughout that country. Twelve farmers would get together to form a Live Stock Improvement Association, pay in one dollar as membership fee, and then organize the society. We agreed to give them a pure bred bull of any breed they desired, two or four boars, and five or six rams, or more possibly if they required it. Now, we organized the first year thirty Live Stock Improvement Associations requiring pure bred bulls, and I found this: one of the Associations happened to be quite near a fairly large city, and they asked for one Ayrshire bull for that district around there; in another district they asked for two Holstein bulls; the remaining twenty-seven asked for Shorthorn bulls, and without

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one exception they wanted Shorthorn bulls of a milking strain. This showed me that the Shorthorn cow of the milking strain is going to make a settlers' cow. He wants a cow that will give him cheap feed for his family; he wants a cow that will produce a steer and give him cheap beef, which has been economically fed; he wants a cow that he can kill when she is beyond usefulness as a breeder, and will also assist him in feeding his family. We have a great country to the north of us, over 16,000,000 acres in extent, and it is developing far more rapidly than a great many of us imagine. There is going to be a great market in that country for pure bred stock in the not very distant future, and it seems to be the tendency of the people there to breed cows that will answer these two purposes. I want now simply to repeat what I said at the beginning. We do not hope to have the milking Shorthorn take the place of the milking cow in the dairy section, but I do feel that the milking Shorthorn is a cow that will fill a great need in many of the sections of Ontario where farmers are producing large families.

W. R. Reek: It seems to me that a great deal of the misunderstanding regarding dual purpose Shorthorns is due to an improper conception of the term. Anyone here familiar with the types of cattle prevalent in Ontario twenty-five years ago, will probably remember the large, framy Shorthorn cows which were to be found on every farm. These, as you will all agree, raised calves which were excellent for beef purposes and they also gave from six to ten quarts of milk twice a day, and many of them even more. I am afraid when we use the term "dual purpose" many expect an altogether different type, instead of just a modification of the type which we have at the present time. You may take the Holstein for example, and those which are so prevalent and so popular in Ontario now are considerably different from the cattle which they had in Holland some time ago. They were used not only for milk production, but for beef as well, and many critics claim that it was very good beef.

There are one or two points which Prof. Day mentioned that I would like to carry a step farther. He told you that there were certain classes of cattle in England known as the Dairy Shorthorn. They were pedigreed cattle. He also told you that buyers from other countries were so anxious to obtain these that the English breeder scarcely knew what to ask for them. We in Canada admit that the English foundation stock is the best that can be had. The people in England are quite willing to accept for registration in their herd books a great many of these dual purpose Shorthorn cattle. Our people cannot purchase them with the idea of breeding, simply because our breeders say that they are not willing to accept this particular class of cattle for registration unless they trace to certain herd books. Now, it seems to me that if these cattle are fit for registration in England, they should be registered anywhere in the world. By our attitude we are just simply placing a monopoly in the hands of a few large breeders in the Old Country, and we are keeping out of Canada many of the finest Dairy Shorthorns in England which are to be found in the northern part of England. Those of you who are more or less undecided about the Dairy Shorthorn type not being the right type for beef production, I would like you to see our red cow, Iford Waterloo Baroness. She gave 7,929 pounds of milk before she left England in that particular lactation period, and was still milking sixteen pounds a day at date of sailing. I will venture to say that very few of you will find cows that have straighter lines, or that carry a more graceful form with an abundance of flesh, than she does. I am also quite positive that there are a great many cattle being offered for sale in Ontario as Dairy Shorthorns which have no particular milking qualities whatever.

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We must draw the line very closely and demand form and fleshing along with the milking qualities, because it has been demonstrated very clearly that these can be obtained together to a sufficient extent to make it a feasible proposition for any farmer to raise this particular type of Shorthorn cattle profitably.

MR. TOOLE: There are a great many of the cattle sold that you would not want to buy. It never pays to feed a poor steer. While some may want the dairy strain of cattle, and others the beef strain, still our farmers can do well by buying the dual purpose animal.

OPENING OF THE AGRONOMY BUILDING.

HON. J. S. DUFF, CHAIRMAN.

Mr. Burrell, Dr. Creelman, ladies and gentlemen, I have a program here which calls for a Chairman's address. In the first place I desire to read two letters of regret, and to also mention a few words in reference to several very estimable gentlemen who are unable to be present this evening.

Mr. Duff here read letters from the Rt. Hon. R. L. Borden, Premier of Canada, and Dr. Falconer, President of Toronto University, who has always taken a deep interest in this Agricultural College.

I desire also to express the very great regret, which I am sure you all share, at the illness of the Prime Minister of Ontario. From the inception of the idea of Federal aid towards the erection of this building, Sir James Whitney took the liveliest interest in everything pertaining to it. He kept in close touch with what we were doing with the money, and how it was being expended. Some time ago he expressed the hope that when the new building was erected, if we had a formal opening, he would have the pleasure of being present.

It is a long way to look back to 1874 when this College was first established. Since then, during the various years which have elapsed, while other departments of the College have done great work, still, I think, it is safe to say, there is no department in the College work that perhaps has come home to the people of all the Province of Canada, as the work conducted by Professor Zavitz, in his Department of Field Husbandry. I sometimes ask myself the question if we have any one man in the Province of Ontario who has done as much for those who toil in the fields as the gentleman who presides over the Department of Field Husbandry, this particular branch of the College work. To-night Mrs. Creelman showed me a photograph of the first building, I call it the Husbandry building, in front of which is seated the genial professor out in the open. I understand the photograph is to be enlarged and is to be presented to Prof. Zavitz to adorn these walls, along with a copy of a photograph of the building which he is now leaving to take over these more commodious quarters.

In reference to the Federal Grant to aid the agriculture of the Province, I am sure you all feel as I do that it is a great pleasure for us to have with us to-night the Dominion Minister of Agriculture, the Honourable Martin Burrell, under whose auspices this great building which has not alone Provincial, Dominion, but international importance, was erected. Whatever criticism there may be of the work of the Dominion Government—and of course there will be criticism, we are to expect that—still I think you will scarcely find any criticism, at least unfavorable criticism, in the work that is being carried on by Mr. Burrell, and particularly that portion of the work which placed in the Dominion Estimates

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the money at our disposal for the erection of this building. I want to say another word in regard to Mr. Burrell's work. He has been very considerate; he has been prepared to meet us more than half way; he has been prepared to accept our suggestions, and not in a single instance where we have made suggestions, so long as Mr. Burrell felt that the money was being wisely and judiciously expended, and strictly in the interests of agriculture of Ontario, did he fail to fall in with our views, and the correspondence between Mr. Burrell and the Department of Agriculture of the Province, of which there is a great deal, will bear me out in this.

Just a word in connection with those who have been connected with this institution in years past. On looking back over the list of those who had charge of this institution at Guelph for long years we cannot but feel that they must have discharged their duties faithfully and well. Look at the gradual but steady growth from the few to the present large aggregation of buildings; the large staff of professors; the staff of demonstrators, and the great body of students now assembled here. I say the development of the project suggests to our minds that the men at the head of this College must have had great powers of organization, great powers of endurance, as well as great ability in their respective branches. I think it is safe to say that during all these years strong hands have held the helm in connection with the work. Looking back over the many years' service rendered by Dr. Mills, for twenty-five years in charge of this institution, we can see the work of a master mind. Then for the last ten years the progress of this College, under the supervision of Dr. Creelman, has been advancing by leaps and bounds.

HON. MARTIN BURRELL, MINISTER OF AGRICULTURE FOR THE DOMINION, OTTAWA.

Mr. Chairman,—It falls to the lot of public men to attend various functions of an official or semi-official character, many of which do not refer in any way to our industrial life, and participation in which is a thing not of joy but more professional and formal. But in addition to this kind there are functions of quite a different character; namely, those that mark events of deep human significance, and that have abiding relationship to social advance and national progress, and participation in which does indeed give me deep and sincere pleasure. This occasion is one of those to which I have referred, and I want to express my very hearty thanks to those of you who have been good enough to give me the opportunity of being present with you here to-night. It is hardly necessary to say that any Federal Minister of Agriculture could not be otherwise than gratified, in knowing that Federal funds had been of assistance in making possible the erection of this fine assembly building, I suppose I ought to call it the "Field Husbandry Building;" to have been of assistance in adding this magnificient building to the fine group of substantial structures in which the work of this College is being carried on. I might almost say the extensive national work that is being carried on in this Institution. I use the word "national" advisedly for one or two reasons. Firstly, because there is research work and experimental work, carried on here which is of far more than Provincial value; and secondly, because the influence of the men who have taught here in the past, and who are teaching here now, extends far beyond the boundaries of Ontario; and I would say, thirdly, it is national because many of the young men and women who have here been equipped for their life work, have gone into other

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portions of this vast Dominion, into every Province, and have done their part by precept and example in the development of our national industry, namely, agriculture. Now, time will not permit me to dwell at length on many names of those to whom I would wish to pay a tribute of thanks, those who have had a hand or been closely associated with the inception and carrying on of the great tasks to which this institution is devoted, but I do want to refer to one or two of them. In the first place, all the older men, those who remember him, and many of the young men who have heard of him, will agree with me that special honor is due to the memory of that man who through his ability and interest not only led the work in making such a College possible, but who in his later years was largely instrumental in promoting that great system of experimental farms that stretch from ocean to ocean in a country of such vast magnitude as the Dominion. I refer, of course, to the late Sir John Carling. (Applause.) Then, too, signal gratitude also belongs to a man, happily still with us, who with patience, courage, and ability, discharged for so many years the not too easy duties of President, and assisted so materially in placing this institution on a sound foundation. I refer to Dr. James Mills. (Applause). Now, ladies and gentlemen, those of you who have read the Bible—I suppose that even in these benighted and degenerate days there are a few people still read the Bible—know that when Elijah's mantle fell upon Elisha we are not informed that Elisha was any relation to the great prophet; in this case, however, in the case of your College, the President's mantle seems to have fallen upon one of the family circle and your present president is carrying on the old traditions, and extending the usefulness of this institution, with an energy and zeal which must be as gratifying to his predecessor as it is to all those who are interested in the progress of this College. I would be almost afraid, as did a former speaker, to say that the College was progressing by leaps and bounds, for that is what dogs do, and you might say it was going to the dogs. (Laughter.)

Now, one other name I cannot, of course, omit. This building has been erected to meet the ever growing needs of Agronomy, or Field Husbandry students, and the success of this branch is due to the willing work and loyal service of the man who has made that work of such great importance in the agricultural curriculum—Professor Zavitz. (Applause.) At the Experimental Union meeting in 1895, held in this College, a gentleman, then editor of a prominent agricultural paper on the south side of the line made an address, and I think this extract from it has a somewhat interesting relationship to Prof. Zavitz, who has now been closely allied with this College for some 30 or 40 years. The editor of the paper in his report of this meeting used these words:

"I congratulate the members of the Ontario Agricultural College upon the excellent work being done. I had the pleasure and the privilege last summer of examining your experimental work in company with your enterprising experimentalist, Prof. Zavitz, who is at the head of this Experimental Department. What I saw in connection with this Department was a revelation to me. I never saw anything to equal it before—magnificent demonstration of practical experimental work. It was certainly a revelation to me. I want to have Mr. Zavitz over the line, and some day we will have him by a big salary; you can bet your life on that. We have got some of your men already."

Well, gentlemen, this was in 1895, and in 1914, Professor Zavitz is still here. (Applause.) He is still here, in spite of the fact that I believe he has had many an alluring invitation to go to the other side of the line and I am

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certain that I but voice the sentiments of every man in this room when I say: here I hope he will remain. (Applause.) The nature of the work with which Professor Zavitz is concerned is of prime importance, and the extent of its operations are of the most far-reaching kind; it is a class of work perhaps the most important of all agricultural lines of research. Formerly of a very wide and inclusive character, the word "agronomy" has got of later years a somewhat more restricted meaning, namely, that of special agricultural research. I think, perhaps, it is a word that is more happily described as a science concerned with the study of the crops, and more particularly of field crops, and the soils and conditions in which they grow. It is quite evident that no small man need apply. It is true. The agronomist, or field husbandman, has not only to have brains of a very useful character, but he must be able to daily apply them to overcoming problems that obstruct the practical carrying out of the most useful ideas in field husbandry. I could name an endless variety of branches of study which come directly within the scope of the agronomist, but time will not permit, and even if there were time I know you would not have the patience to listen to me to-night. The agronomist is literally the man to whom we all look to make two blades of grass grow where but one grew before; and not only that, but two blades of grass of a finer grain than the one that grew before. Agronomy, again, is but the national process by which all plant life has been lifted up to the highest variety and form. We are told again and again that knowledge is power, and it is true that to-day the agronomist is able in a single generation to accomplish that which it took our forebears years to do. It is to further and facilitate the experimental work along these lines that such a building as this has been erected; the fixing of finer types of grain and grasses, work of the greatest necessity and importance to the field crops which constitute the necessary food for man and beast, and while increasing the production to decrease the cost of production. These things are not only important but of great scientific interest; they are, in fact, of extreme national importance. But I would say that not the least of the value flowing from such studies as are followed in this great University of learning and intelligence, is the implanting in the minds of the boys and girls of rural Canada the consciousness that agriculture is not only a good and profitable industry, but that it should lead to the attainment of ideals; a higher type of human intelligence which feels well repaid by that true joy which invariably follows the application of energy to the solution of problems lying closest to the mind. For what you have done here for the whole of Canada, and there is a great deal yet to be done, you have reason, ample reason, to be proud, and you may well take a sympathetic pride in what you have achieved elsewhere: in the institutions at Macdonald, Saskatchewan, Manitoba—I cannot go over the whole list—in all these institutions there is very much being accomplished, and in every one of these institutions I have had the honor to visit the keynote has been "advance."

In our 26 experimental farms we are, of course, confining ourselves to work along simple lines—along simple lines, but of the greatest assistance to the agriculture of the Dominion. The work in the Provincial institutions is also along similar lines. In our Seed Branch we are proclaiming the gospel of pure seed, and the men connected with these experimental organizations are teaching those who attend, and those who apply for advice, how best that gospel can be embraced. (Cheers.) A great missionary work is being done by the Seed Growers' Association all over Canada. This Association has been very aptly described as a clearing house for pure seed. We are giving liberal Federal

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assistance to this Association for the supplying of pure seed to those who make application. In the Live Stock Branch of the Dominion Department of Agriculture we are also working along similar lines; we are distributing pure bred males all over Canada with the desire of raising the standard of the herds throughout the Dominion. In our Dairying Branch, amongst other things, we are also doing a lot of valuable experimental work. Our cow testing work, carried on for the past 10 years, has to some extent been instrumental in increasing the annual average yield per milking cow of Canada by some 1,000 pounds—a pretty good record. There has been a great deal said about the high cost of living under protection, and all that sort of thing, and I would like to point out to this meeting, that, while it is true that the dairying industry of Canada has not increased as much as it might have, in ten years the increase in cows in the Dominion was 7 per cent.; the population of Canada had increased 34 per cent., while the actual milk production had increased 43 per cent., I think a pretty good showing. I see these young gentlemen are waiting for me to cite some specific cases. I might cite a great many specific cases of what has been done in chemical work and in field husbandry. We have the "Marquis" wheat, with which is associated the name of Saunders; we have the O. A. C. Barley No. 21, with which is associated the name of Zavitz. and your work here brings to the mind not only the great agricultural results that have been achieved, but suggests the vastness of the agricultural field for work in Canada to-dav; in grain, and fruit, and stock improvements of endless possibilities. Mr. Newman, of the Seed Growers' Association, recently estimated that forty million bushels of seed were required to produce Canada's annual yield, and that if this yield were from pure seed the returns would be increased perhaps twenty-five per cent. It is, however, impossible, in these specific cases to which I have alluded, to adequately convey to your minds the immense stream of wealth flowing from the farms of Canada through the various financial channels, and thus influencing the body politic of this country; but I can say that great as it is, our efforts have and always will be to make it greater. (Cheers.).

Now, the statement that our friend Prof. Zavitz has had many a temptation to go elsewhere, but has decided to stay here, and in view of the fact that for so many years he has devoted his services to this College and this country, urges me to say a word or two in reference to the human side of this question. This country—and I am speaking of agriculture in relation to this country—requires just such men, and all she can produce, to stay and devote their energies to her upbuilding. Prof. Zavitz some years ago, not many years ago, came with his little seed room—this university then consisted of a small arrangement of buildings—his knowledge and experience matured; strength came, and then the development of better equipment, and now you have this splendid building devoted to this work, and it is by no means finished yet. The crying need in Canada, and I am speaking in a general sense, is for men; and speaking officially here to-night, and in the fullest sense of that word as I do now, I say to all those concerned in the stimulation and progress of the national industry: Get the best men, and do not hesitate to pay them as men doing creative and original work should be paid. (Applause). I am delighted with the reception of that last remark: it shows that these young gentlemen present are looking out for large salaries. (Laughter.) It is perfectly true that a good many trained here have in the past sought fresh fields to the south, where larger financial rewards were offered, but to-day there are fewer of such men, and I know in our own case, that of the Department of Agriculture at Ottawa, that in some cases where our men

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have left we have been able to bring them back. There is ample room for every one of them here; it is the duty of myself and my brother Ministers of Agriculture, it is our business, to see that these men are brought back; that when educated here they are kept here, and to see that their services are given to their country. Now, while technically trained men, men of the type I am referring to, do not receive as much as they are worth in this country, on the other hand there is a class of men who sometimes get paid a great deal more than they are worth. May I also say a word in regard to these young men who are preparing themselves for a career as teachers of agriculture in the broadest sense of that word. I speak with a great deal of hesitation and temerity, for the younger members are generally the most critical body in an audience. But I will take unction to my soul and say to them, as a certain professor once said to an undergraduate of the fresh variety: "Young gentleman, none of us are infallible, not even the youngest." (Laughter.) Let me say to these young gentlemen, whether you have decided to stay here or go elsewhere in Canada, you have got exceptional opportunities, and with your ability for acquiring knowledge you must also acquire that faculty of imparting it to others. That is not the only side to this question; there are other great qualifications if you are to serve your own day and generation in a broad and useful sense. It is understood, of course, that your life work represents more to you than the mere financial remuneration for doing it. Ruskin has said: "It is physically impossible for a healthy-minded, intelligent, and brainy man to make money the chief object of his thoughts." All healthy-minded people like making money, but it should not be the main object of their lives. He said it was something better than money. Doctors like fees and making them, but the main object of their lives is not making fees; on the whole they desire to cure, and if they are good doctors they would rather cure their patients and lose their fees than kill their patients and collect their fees. And so it is with all rightly trained men; it is their profession first and their fees second; fees are very important but always second to their work. Now to those of you who have not read Ruskin's book, "Crown of Wild Olive," I would say you will find it very profitable to read, mark, learn, and inwardly digest. Secondly, as teachers—and I am speaking still to the young men here—as teachers your work is productive and valuable just so far as you can find receptive minds and you have got to make them receptive. The man who is temperate, sincere, and courteous will be a great teacher, while the man who has not these qualities will fail dismally, and many a time I have seen it. You will have to surmount obstacles, but remember that failures in life are caused by want of the qualifications to which I have referred, and especially is this true when we come to men occupying official positions. Another thing, knowledge, so far as Governments have experience is a great thing to have; it should be on tap, but not on top. The practical hard-headed farmer of this country often tells us that he is fed up with advice; I have heard that said many a time, and therefore young men should remember that while it is a good thing to be sure it is not well to be cocksure. The greatest teachers, and you will agree with me, are characterized by great humility; they know their limitations. It is far better for you to find out your own limitations and to know them than it is to have other people find them out. You should never forget that you have not only to study here but you have to learn afterwards to deal with human nature satisfactorily, and that is not always an easy acquirement. Now, just a word in closing to those young men who are about to becom

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teachers. Upon you rests the future of this country, see to it that you do not fail in your duty.

I need hardly point out to this audience, interested as you are in agricultural matters, the necessity for a strong educational propaganda. The Government's efforts are sometimes criticized in none too wise a spirit. Even so great an authority as Mr. Hill, has given his imprimatur to the remark: "Take instruction to the farmers and do not spend so much time on college professors." That farmers should have practical and direct instruction is well; but surely he should have some technical knowledge; surely it is necessary to strengthen the foundations; indeed, it is quite evident that without a good sound technical training, such as the students of this college receive, it would be impossible to send out into our communities the hundreds of young men who are now being sent out, and who are giving assistance in a practical and sympathetic way; assistance that will have a welcome wherever it is given. I stand for training students in their college work, and I add further, combined effort is necessary.

Speaking for the Federal Cabinet, which was called in 1911, it was proposed by the Right Honorable R. L. Borden, that assistance be given to agriculture by way of a vote to the Provinces. At that time, as Minister of Agriculture, I confess I could not see my way to introduce or take a step that would make for the maximum co-operation of the provinces and yet with a minimum of dissatisfaction of all the provinces of Canada. I studied this question, and had the help of a man formerly associated with teaching in this College, I refer to Professor C. C. James, well known to you all. (Applause.) We were ultimately successful in introducing a Bill comprehensive of all agricultural education. I have gone through this country from coast to coast in regard to this matter, and we were often faced with difficulties. On the one hand urged to give the money to the provinces outright, and on the other to keep it under Federal control and spend it entirely as we thought fit. I thought then, and I still think, that the middle course which we adopted was the best; of laying down certain lines on which that money should be spent; allowing the Province autonomy after that in the matter of spending it, and we would have co-operation, and co-operation was what we were aiming at. In that Bill there was a generous interpretation of the word "instruction" and by it Agricultural Colleges have been able to do work that they would not have been able to do otherwise. It was questioned at one time whether that money should be allowed towards the erection of buildings. I believed it should, and I think in the erection of such a building as this in which we are assembled here to-night, a building necessary for the proper carrying on of the educational work in the branch to which it is to be devoted, the money was well spent. In the meantime we have been able to establish some splendid institutions. In Alberta, by this grant, it has been possible to erect three Agricultural Colleges. In one of these some 200 students have attended; among them some 30 or 40 girls, from farms in Alberta, have been able to take courses in Domestic Science. And the Colleges of Ontario have been strengthened in such a way that I think you cover the Province pretty well now. I will not talk on these matters any longer. You will find all these particulars in the Official Journal. I allude to a publication which I have had in mind for years past; it is now an accomplished fact; The Official Agricultural Gazette, the paper is now in type and will be published within the next week or ten days. It will be devoted to the cause of agriculture both Provincial and Dominion, and it is our intention to place it free in the hands of all who engage in the work of agricultural instruction.

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In concluding, a word in reference to the form in which Federal assistance has been given to agriculture and to the Province. I can only repeat, gentlemen, what I said in the House at the time: success depends entirely on the spirit in which it is worked out. Small difficulties have arisen and will arise, but in the main there has been a sincere desire to help the interests of agriculture, and I gladly express my hearty appreciation of the manner in which those from every Province have assisted.

Those who have read, as many of you have, Emile Zola's "Debacle" will agree with me that no more powerful or realistic portrayal of the tragic horrors of war could be given than is given by this author of those three awful, lurid days before Sedan. It is that of a French soldier lying rifle in hand in all those hours of agony, deafened by the tumult of the battery firing without ceasing, the rending of the air by the cannonading, who, turning his head sees on a distant hill, protected by a southern slope a peasant quietly working with his plow drawn by a white horse. You say a miracle, yet notwithstanding in some indefinable way that picture by Zola was able to symbolize and typify human life and human destiny.

Upon you gentlemen here who are to lead the way to finer and better things in agriculture there rests upon you and those whom you will influence large responsibilities and a great privilege. Unhappy the state or nation which neglects its agriculture, which neglects its duty to the land, which neglects or withholds their own from the children of the soil. They say this is a country of broad acres, untrodden lands; I say then not only are you under the sternest necessity, and those associated with you in this work, to do all you can for the agricultural class, but you are also under the necessity of recognizing the toilers in the cities and factories, to recognize that this nation's prosperity is intimately bound up with the principles of agriculture, and that there should be a generous and sincere desire on the part of these toilers in the city and those of the farm to extend a helping hand one to another.

We have only touched the fringe of the work associated with Prof. Zavitz's branch in the erection of a building such as this; we have only touched the fringe of that far greater work which confronts us in every direction. I can say for myself in conclusion, and the Government of which I have the honor to be a member and of representing at this pleasant function that it gives me the keenest gratification at what has been accomplished here, and that I will give you the heartiest assistance in co-operating with you in your work and in everything that makes for the common good. I want now to present, as I think it is a part of my duty to present, the key of this building to Mr. Duff, whom I presume will open the building in due form. (Applause.)

MR. WESTBROOK (President New University of British Columbia): It is, indeed, a very great pleasure and privilege for me to be here. I have come a long way, and I think you will agree with me that British Columbia has done pretty well in furnishing the Hon. the Minister of Agriculture, and has sent to be present on this occasion the entire staff of the University of British Columbia, the entire body of the Alumni. I am looking forward with a great deal of pleasure, not to say apprehension, to the time when the University of British Columbia will be a going concern so far as its scope as a College of Agriculture is concerned; when there will be a formal opening of its buildings, and I am entertaining the hope that the Agricultural College of Guelph will do as well for the University of British Columbia as British Columbia has done for this Ontario Institution, the Ontario Agricultural College. I may say that the apprehension relates only to the one question in my

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mind, that the Ontario Agricultural College will perhaps not be able to send her entire staff. I feel very proud to be present on so significant an occasion as the opening of this building which has been presented to the Province by the Dominion Government, a building which is to be the workshop of one of our most cultured and splendid citizens—Professor Zavitz. In the endeavor to find out something about what was necessary for the advancement of our own University I have gone about this country of Canada, my native country, and a great deal throughout the United States, my adopted country, for some eighteen years, but I have never been able to get away from the traditions of my own country and the influence of the work of this Ontario Agricultural College, and this man, Prof. Zavitz. The other day I came through Tennessee, and even there I found, I think, a student of Prof. Zavitz, in Prof. Morgan. I have found students of this College in Illinois, Wisconsin, Minnesota, Montana, and in States all over the United States they can be found if you wish to continue the search. I wish I might add something to-night to what has been said, something to the store of information which you can take away with you. Now, I cannot contribute to-night to the work to which this particular building is devoted, but if Dr. James were here he could give you something to carry away. You are all very much under obligation to the man for whom I am speaking to-night; I am under obligation, and the Province of British Columbia is under obligation to him. Upon appealing to Ottawa for help in laying out some work of the University of British Columbia—in that which related to agriculture—the Hon. Minister of Agriculture was good and kind enough to send to us C. C. James, who spent nearly ten days going over every problem, and telling us what we needed. If we do not do well it will not be because we have not had good advice, but for some other reason. Dr. James is a man who represents knowledge in a particular and definite line. He also is a man who is somewhat rare at this present time, a man who possesses a thorough grasp of all that pertains, even in detail, to each individual branch of this great institution and who is able to see properly their relationship one to another, and I wish not only for my sake, but yours, that he was here to-night. He was formerly a professor in this College. When the President asked me to speak for him he said, "You will just take Dr. James' place." I said: "That, sir, is impossible, and I know it better every minute." Now, I have come here not to leave something with you, but to take away a great deal of information which may be of use to my Province.

MR. SCHOFIELD, M.P.P.: I assure you it is a great pleasure to have been welcomed here to-night. As I look over this gathering of students my mind goes back to fourteen or fifteen years ago, when there were only a few students at this College. It is very gratifying to see the attendance growing. As I listened to the address of the Honorable Martin Burrell I thought of the great advancement that has been made in agriculture in the last few years. At present we hear much about the high cost of living, but I do not think that those commodities which the farmer has to sell will ever be much less in price than they are to-day. One of the reasons for higher prices of foodstuffs to-day is the fact that we are producing better articles and that the people have more money with which to pay for these better articles. The term "high cost of living" is not the correct one; it should be "the cost of high living." A great many of us are spending more money than we should. I cannot let this occasion go by without thanking the Honorable Minister of Agriculture, of the Federal Government, for the assistance which has been given to this institution, first, in providing money for this splendid building, and then formally opening the building.

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W. B. ROADHOUSE (Deputy Minister of Agriculture for the Province of Ontario): I rise with much humility, but with no little degree of satisfaction as I remember that public speakers are rarely, if ever, encored as is an orchestra. One year ago I had the privilege of addressing a few words at the annual meeting of the Ontario Experimental Union gathering, on the subject of co-operation between the Federal and Provincial Government of Canada. I regard it, therefore, as a privilege as well as a pleasure to have thus so soon an opportunity of participating in this historic occasion which marks the opening of this splendid building—one of the first great tangible assets which this Province has received, as an aid to Agriculture, from the Federal Government—and which marks, too, the beginning of a new policy. We appreciate the fact, sir, that there is no question but what the money placed at our disposal has been wisely spent. I make no under-estimate of the value of this money, but let me say—and in this I think I voice the sentiments of all present, as well as my own—that we appreciate as well the fact that this occasion has been the means of bringing the Dominion Minister of Agriculture to Guelph for the first official visit since his inauguration to the high position which he holds in this country. That is a fact of which we are very proud. For while money is one thing, we appreciate still more the kind and personal interest which he has shown by his presence here to-night, and to those feelings to which he gave such eloquent expression in his address just delivered. This marks the opening of a new policy. Great and important as is this building—a corner stone in the history of the College—it is yet but an incident in the broad and beneficent policy which will go down in history inseparably associated with the name of the Honorable Martin Burrell who has brought that policy into legislative life, and who has watched its growth and development with such skill and care ever since. This I say, is but an incident in the general policy; this is one of the first Departments of the College to be benefited, but not the only one. As many of you are aware another building is arising on the landscape, not far from here, to be devoted to the advancement of the poultry industry of the Province, and particularly to the advancement of the poultry industry of this College. That building, I am given to understand, is already partially ready for occupation, and in a few months when it is finally completed, will make a very distinct change and improvement in the equipment of this College. But that is not all. I am betraying no departmental or other secrets when I tell you that other departments will be treated in turn as the years go by, and that one structure and its equipment after another will be made commensurate with the growth of this great institution, and in a few years we will more fully appreciate, if that is possible, the splendid advantages of the arrangement which has been made in the working out and bringing about of these great improvements and additions to the equipment of the institution. One building after another, I anticipate, will be added, and the great and splendid reputation which this College enjoys all over the North American continent—in fact world wide—will be maintained to the highest degree. The expenditure is not confined to this College alone; it is to be spread out over the whole Province. We shall continue and augment the special District Representative work which touches the life of this College so closely. I think that work perhaps more than any other, has been responsible for stopping that exodus to which the Minister so strongly alluded —the exodus of our students and graduates to positions across the line. This work will also be greatly extended and strengthened in various ways that time will not permit me to mention, but we will follow a well thought out and definite programme as years go by.

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I am glad, sir, that the Honorable the Minister of Agriculture for Canada has referred to the human side. We are dedicating this building to a two hundred million dollar industry. We are dedicating it to the interests of the field crops of this Province, the annual value of which aggregates this enormous sum. But in consideration of the vastness and bigness of these interests it is well that we should not lose sight of the human individual side. This building is dedicated to those who have the inestimable privilege of being students at this institution. It is dedicated to those who are enabled to take a Short Course at this institution. It is dedicated to those 5,000 farmers throughout the Province who through the Experimental Union are every year carrying on experiments in the growing of different grains to the great advantage of the industry as a whole, and whose work should be greatly facilitated by the assistance of new equipment. But it is dedicated just as surely and as truly to the interests of the man on the farm who to-day is using O.A.C. No. 21 barley, yet knows not whence it came or to what organization he is indebted for the advantage he is receiving. To all these interests is this building dedicated, and I can only conclude with the hope that it may serve them as well and as conclusively as might be expected from such an auspicious opening and inauguration.

DR. CREELMAN (President of the Ontario Agricultural College): It is not my purpose to do anything at this particular time in the way of an address, except to earnestly welcome to the Ontario Agricultural College all the men and women that I see before me at the present moment. May I be permitted to divide them into the classes in which they naturally fall, and to welcome to the College in this beautiful new building our visitors who are not strictly interested in the business of agriculture; I refer to our distinguished visitor from British Columbia; the Members of the Dominion Government; and to the Members of the Local Government, and others who have taken a personal interest in agriculture, and who have honored us in this day of agricultural uplifting, and are paying tribute to the agriculturists of the Dominion, and of the Province of Ontario. May I also heartily welcome our friends and graduates and undergraduates who are assembled for the special function which takes place tomorrow, and the following days. I appreciate perhaps more than any other that class of visitors who feel that while as students attending this institution they received sufficient information and were filled with sufficient enthusiasm to bring them back to once more attend one of the same kind of functions they witnessed in the past. May I say on behalf of the staff of the College—and I speak on behalf of the whole College—that we welcome the Short Course students who have come to us to-night in large numbers, including those who entered in the trial courses a few days ago, and those of the Live Stock and Seed Judging class to-morrow; those who have come for instruction in bee culture, poultry and other courses. To the hundreds who have assembled in the City of Guelph from all over Ontario to-day, we open our doors as much as to those who are attending here for a number of years. To the men on the soil, the men who do the work—those of us who are privileged to live in a higher atmosphere, owe our very positions to these men; men in the back townships who by their hard work, industry and effort, create this $200,000,000 industry which has made it possible for us to be here to-night to open this building.

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THE

Fruits of Ontario

PREPARED BY THE FRUIT BRANCH

(PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE, TORONTO)

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To His Honour COL. SIR JOHN MORISON GIBSON, Knight Commander of the Most Distinguished Order of St. Michael and St. George, a Colonel in the Militia of Canada, etc., etc., etc.

Lieutenant-Governor of the Province of Ontario.

MAY IT PLEASE YOUR HONOUR:

The undersigned begs to present herewith for the consideration of Your Honour the Report on the Fruits of Ontario.

Respectfully submitted,

JAMES S. DUFF,
Minister of Agriculture.

TORONTO, 1914.

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FRUITS OF ONTARIO

INTRODUCTION

When the first fruit trees were planted in Ontario, probably about 150 years ago, the settlers had no reliable information to guide them in selecting varieties or in caring for the trees after they were planted. But the experience of these early settlers was taken advantage of by their descendants who, with the additional knowledge possessed, were able to make some progress, although scattered as they were in those early times without good means of intercourse. The dissemination of information from one to another and to the new settlers who were coming in was slow until the railways were built. Then fruit-growing became much more general, as trees could be easily transported from one part of the Province to another. In 1859 a few enthusiastic horticulturists organized the Ontario Fruit Growers' Association. Meetings were held in different parts of the Province, and the people were urged to plant more fruit. This organization has for the past 50 years by its meetings, annual reports, the *Canadian Horticulturist*, and in many other ways, done very much to bring about the present marvellous development in the fruit industry of Ontario. Realizing that more definite information was needed to guide fruit-growers in the planting of varieties and the culture of fruits, the Association in 1893 urged upon the Government the importance of establishing Fruit Experiment Stations throughout the Province. The idea received the approval of the Government, and in 1894 four stations were established, this number being increased to thirteen in the course of a few years. To these were sent many varieties of fruits, which were tested and reported upon each year by those in charge of the stations. As these experimenters were all practical fruit growers, and in most cases had made a specialty of some kind of fruit, much valuable information regarding varieties and their culture was accumulated by the Department of Agriculture. After the stations were established, it was felt that in due time a hand-book should be published that fruit growers generally might get the full benefit of the information so obtained.

In 1913 it was deemed advisable to revise this hand-book in order to bring the contents up to date and also to provide better illustrations where possible. This revision was undertaken by the Fruit Branch of the Ontario Department of Agriculture, and the present bulletin is a result of this work. In it, new varieties and new photographs have been included, and the descriptions of varieties and cultural directions have been brought up to date.

The descriptions have been verified by comparison with those given in the works of the world's greatest pomologists, such as the "Dictionnaire de Pomologie," by Andre Leroy, of France; "The Fruit Manual," by Thomas Hogg, of England; "The Fruits and Fruit Trees of America," by Charles Downing, of Newburgh-on-the-Hudson; "The American Fruit Culturist," by J. J. Thomas, of New York State; "Apples of New York," by S. A. Beach, of Geneva, N.Y.; "The American Horticultural Manual," by Prof. J. L. Budd, late of the Iowa State College of Agriculture; "Plum Culture," by Prof. F. A. Waugh, of the Massachusetts Agricultural College; "Apple Culture" and "Plum Culture," by W. T. Macoun, of the Central Experimental Farm, Ottawa; "The Grape Manual," by Bush, Son & Misener, of Missouri; the Reports of the Michigan Agricultural College, of the American Pomological Society, of the Ontario Fruit Growers' Association, etc., and many other works.

These have again been modified by the reports of the experimenters in charge of the fruit stations, when it was proved that certain varieties, otherwise desirable, were not adapted to the districts in which they were tested.

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In the case of some of the newer varieties of small fruits, especially strawberries and some of the raspberries, also in the case of some of the larger fruits which are somewhat rare, the descriptions have been in part made from the reports of the experimenters, or from the reports of reliable pomologists. From Professor H. L. Hutt, of the Ontario Agricultural College, and others, descriptions of some varieties were obtained.

The nomenclature adopted in these descriptions is based on that of the American Pomological Society, but where names which have been commonly adopted in Ontario would not be easily recognized under this nomenclature the old names have been left unchanged.

The fruits have been divided into four groups in this work, namely: (1) Tree fruits comprising the Apple, Cherry, Peach, Pear, Plum, and Quince: (2) Grape; (3) Bush fruits, comprising the Blackberry, Currant, Dewberry, Gooseberry, and Raspberry; (4) Strawberry. Within these groups the varieties have been arranged alphabetically, as far as possible, for ease in reference.

As it is the object of the Fruit Branch to make this work of the Fruit Experiment Stations as generally useful as possible to the fruit growers of Ontario, it was felt that the "Fruits of Ontario" would be incomplete if published without cultural directions, hence these are given. The lists of varieties recommended are taken from "Fruits Recommended for Planting in Ontario," Bulletin 211, as prepared by the Fruit Branch. The other matter has been specially prepared and revised for this work.

It is hoped that the objects for which "The Fruits of Ontario" was prepared will be accomplished. These are to assist the fruit grower:—

1. In the selection of those varieties most desirable for planting in his particular locality, either for home or for market.

2. By affording a convenient reference in the identification of varieties now grown in the Province.

3. By furnishing a reliable description of the size, color, general appearance, and real value of the varieties often incorrectly described in magazines and catalogues.

4. By giving sufficient cultural directions to enable him to make fruit-growing a success.

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1. Tree Fruits

Among what are commonly classed as the tree fruits are the apple, cherry, peach, pear, plum, and quince.

So confident are the Ontario fruit growers of the future of the industry and the continued profits which will be obtained from the culture of these large fruits, that many acres of trees are being set out annually.

The great importance of the fruit interests may be fairly judged by the following figures for Ontario from the Dominion census of 1911:—

—	Not Bearing.	Bearing.	Total Trees.	Bushels.
Apple Trees	2,123,040	5,643,217	7,766,257	6,305,462
Peach Trees	878,436	803,417	1,681,853	503,075
Pear Trees	228,208	511,512	739,720	417,397
Plum Trees	356,195	767,827	1,124,022	331,278
Cherry Trees	328,341	507,396	835,737	137,281
Total	3,914,220	8,233,369	12,147,589	7,694,493

THE APPLE

There is no part of the world where better apples are grown than in the Province of Ontario, and owing to the hardiness of this fruit it can be successfully cultivated over a very large part of the Province.

From the Ottawa River, which bounds the Province on the east, to the great lakes on the west, a distance of about 500 miles, and from the St. Lawrence River and great lakes on the south to latitude 45 degrees, and even 46 degrees, on the north, a distance of about 280 miles, there are many flourishing commercial apple orchards. But apple-growing is not confined even to this area, for scattered here and there over the newer parts of Ontario almost up to the Manitoba boundary are trees which are bearing good apples and supplying the settler with fruit for home consumption.

Owing to the material difference in climatic conditions between the extreme southern and the northern parts of the Province, some varieties of apples are more adapted to certain sections than others, not only on account of their varying degrees of hardiness, but because some kinds produce better fruit in certain sections than in others. Furthermore, as apples grown in the southern parts of the Province do not keep as well as those grown in the northern sections, the fruit matures earlier, and hence does not come into keen competition with, perhaps, the same varieties from other sources. Each part of the Province, therefore, where apples are grown can produce fruit which has a fair chance of commanding the highest price on the market. As these climatic conditions cannot be changed, it behoves fruit growers in the south-western peninsula to make a specialty of growing fruit for the early markets, for there is no other section which can compete so favorably in the production and sale of early apples, especially for the rapidly growing market in the Northwest.

The fruit growers in the districts bordering on Lake Huron, Lake Ontario and the St. Lawrence River, where the longest keeping apples of best quality are grown, should make a specialty of winter fruit, and by so doing win for themselves a reputation for this class of apples.

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In eastern Ontario, where the McIntosh, Fameuse, and other high-class early winter dessert apples are grown so successfully, the fruit grower, though at present handicapped in the growing of late keeping varieties, can obtain for his dessert apples the best prices and thus make his orchard as profitable as those in any other part of Ontario.

For the north, there are a number of varieties, mostly of Russian origin, the hardy survivors through many trying winters in the colder parts of Russia, and these, with the hardy crab apples, are proving a nucleus from which it is believed will be developed, by cross breeding with the best Canadian apples, good dessert varieties which will be grown almost to the extreme northern limits of the Province of Ontario.

Selection of Varieties.

One of the most important things to be considered in planting an orchard is the selection of varieties. Some of the most serious mistakes in the past have been made in this particular. In many cases worthless varieties have been planted, which is hardly to be wondered at when planters had little more to rely upon regarding varieties than the exaggerated descriptions given by travelling tree agents. But in these days, when we have reliable information about all classes of fruits for all sections of the Province published annually and distributed free, there is no excuse for planting anything but the very best varieties suited to each section.

One mistake to be avoided is that of planting too many varieties, particularly in commercial orchards. A half dozen good winter sorts have been found to be sufficient. For home use, however, the list might be doubled, or at least lengthened, to suit the preferences of all members of the family. There should, in any case, be varieties enough to cover the season and give a bountiful supply from earliest to the latest. One or two summer varieties, three or four autumn, and half a dozen winter varieties would be about the right proportion of each to plant.

Another precaution which has to be taken in planning a commercial orchard, is that of planting too large a block of any one variety. For convenience in harvesting it is no doubt best to plant trees of the same variety near together, but on the other hand if these blocks of one variety are too large it may be the cause of poor crops, for there are many varieties which are self-sterile, that is, the pollen which they produce will not properly fertilize their own flowers, although it may be quite potent on the blossom of some other variety. This question has not been sufficiently studied to warrant us in saying definitely just which varieties are self-sterile and which are self-fertile, although from experiments which have been made, the following varieties appear to be more or less self-sterile: Yellow Bellflower, Chenango, Gravenstein, King, Northern Spy, Primate, Rambo, Red Astrachan, Roxbury Russet, Golden Russet, Spitzenburg, and Tolman Sweet. None of these should be planted in blocks of more than three or four rows, without some other variety intervening which blooms about the same time. In orchards where such a mistake has been made, it can be rectified most readily by grafting every third or fourth row with some variety which will insure cross-fertilization.

Both tree and fruit must be considered in the selection of varieties. The tree must have sufficient hardiness for the locality, and it is in this particular that the district lists of recommendations give valuable information to intending planters. Productiveness is also an important characteristic. Unfortunately some of the varieties of most excellent quality, such as the Blenheim and King, are lacking in this respect, and, while it may be desirable to plant these for home use, still such a defect is a serious one in a commercial orchard. The age of bearing is another characteristic which varies greatly in different varieties. The Northern Spy, for instance, often requires ten or fifteen years before it comes in bearing, while Ontario, Wealthy, and many of the Russian varieties sometimes bear even in the nursery rows, or at least in a year or two after they are transplanted into the orchard. This is a difference which may well be taken advantage of in the arrangement of varieties in the orchard, for, as a rule, those which are slow in coming into bearing make larger trees and are longer lived, while those which begin early and bear heavily are more or less dwarfed in their growth and the

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trees are shorter lived. For this reason trees of the precocious varieties are often planted as fillers between rows of the later bearing and larger growing kinds.

The most desirable qualities in the fruit itself depend largely upon whether it is for the market or for home use. For home use, good quality is the first consideration. Usually those having a spicy or characteristic flavor, such as the Spy, King, or McIntosh, are most desirable. Apples with an acid or subacid flavor are most in demand on the market; nevertheless a good sweet apple is often much appreciated for home use. For the market, a good appearance is the first consideration. Good shipping qualities have also to be considered in the selection of commercial varieties, although no doubt the improvement in methods of packing and shipping may render this of less importance in the future than it has been in the past. The Ben Davis apple has long been recognized as one of the best shipping varieties, on account of its firmness and good keeping qualities. On the other hand, the McIntosh is not a long keeper, and is so easily bruised that it cannot be shipped satisfactorily in barrels. But with improved methods of packing and shipping, it may be shipped to any of the European markets and even placed on sale with the Ben Davis, and it is a question how long the Ben Davis, with its inferior quality, will be able in such competition to hold its place in the market. Those who champion the Ben Davis may take exception to the comparison just made because of the relative difference in season of the two varieties. Nevertheless, we believe that it will be safer in the future for growers to look more to the quality of the variety than has been done in the past, for buyers are already becoming more discriminating, and demand apples of the very best quality.

Ordering and Obtaining Trees.

A complete list of the nurserymen of this Province is published each year by the Department of Agriculture, and most of our leading nurserymen advertise in the agricultural and horticultural papers. Upon application, any of these men are glad to quote prices at which they can supply stock.

It is well, when ordering nursery stock, to order early. Too many leave such a matter till planting time, when they might as well have had their order in several months sooner. By ordering early they are more likely to obtain just what is wanted, and if the nurseryman has not the desired varieties on hand, he can obtain them elsewhere by the time they are needed.

When the trees arrive from the nursery, it is best to unpack them as soon as possible, and, if it is not convenient to plant them at once, the roots should be spread out and buried in a deep trench till they can be permanently planted. The longer the trees are to remain in this position the more carefully they should be heeled in.

VARIETIES RECOMMENDED.

General Lists of the Most Valuable Varieties for Market Approved by the Board of Control.

Summer.

Astrachan, Duchess.

Fall.

Gravenstein, Wealthy, Alexander, McIntosh, Fameuse, Blenheim.

Winter.

King, Hubbardston, Greening, Cranberry, Baldwin, Spy, Stark.

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VARIETIES ESPECIALLY ADAPTED TO HOME USE.

Summer.

Transparent, Primate, Sweet Bough, Duchess.

Fall.

Chenango, Gravenstein, Wealthy, McIntosh, Fameuse, Blenheim.

Winter.

King, Wagener, Swayzie, Greening, Tolman, Spy.

HARDY APPLES RECOMMENDED FOR SECTIONS NORTH OF LATITUDE 46 DEGREES, OR APPROXIMATELY IN A LINE WITH THE OTTAWA RIVER.

Summer.

Transparent, Lowland Raspberry, Charlamoff.

Fall and Winter.

Duchess, Wealthy, Hibernal, Longfield, Patten, Whitney, Hyslop, Milwaukee.

CRAB APPLES.

Whitney: A large crab of high quality, suitable for planting in the extreme north, where other apples will not succeed. May be used for dessert or cooking.

Martha: An early crab of fair quality.
Transcendent: Yellowish crab, season early autumn.
Hyslop: Dark, rich, red crab, of late season, quality only fair.

DISTRICT LISTS.

NIAGARA DISTRICT.

(Including the Niagara Peninsula from the Niagara River to Hamilton and north to the escarpment.)

Robert Thompson, St. Catharines.

Commercial: Astrachan, Duchess, Gravenstein, Blenheim, Wealthy, Wagener, McIntosh, Hubbardston, King, Greening, Baldwin, Spy.

FONTHILL DISTRICT.

(Including Townships of Pelham, Stamford and Thorold.)

G. C. Brown, Fonthill.

Astrachan, Duchess, Greening, Fameuse, King, Baldwin, Spy.

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BURLINGTON-OAKVILLE DISTRICT.

(Including the southern part of the counties bordering on Lake Ontario between Hamilton and Toronto.)

A. W. Peart, Burlington.

Duchess, Wealthy, Ribston, Greening, Blenheim, King, Baldwin, Spy.

W. F. W. Fisher, Burlington.

Duchess, Wealthy, McIntosh, Fameuse, Ribston, King, Baldwin, Spy.

LAKE ERIE DISTRICT.

(Including approximately the Counties of Haldimand, Norfolk, Elgin, Welland, excluding Fonthill District.)

Jas. E. Johnson, Simcoe.

Wealthy, Fameuse, McIntosh, Baldwin, Greening, King, Spy.

ESSEX PENINSULA.

(Including Essex, Kent and Pelee Island.)

J. L. Hilborn, Leamington.

Duchess, Blenheim, Baldwin, Stark, Hubbardston, Spy.

J. Atkin & Son, Leamington.

Red Astrachan, Duchess, Blenheim, King, Hubbardston, Baldwin.

BRANT DISTRICT.

(Including Counties of Brant, Oxford, Middlesex and south-western part of Perth.)

J. C. Harris, Ingersoll.

Duchess, Gravenstein, Blenheim, Ribston, Alexander, Greening, Baldwin, King (top grafted), Spy.

C. W. Gurney, Paris.

Blenheim, King, Baldwin, Spy, Greening.

FOREST DISTRICT.

(Including the County of Lambton.)

D. Johnson, Forest.

Duchess, Greening, Baldwin, Hubbardston, Golden Russet, and (if grafted on Tolman) King and Spy.

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LAKE HURON DISTRICT.

(Including Counties of Huron and Bruce.)

D. F. Hamlink, Goderich.

Astrachan, Duchess, Greening, Blenheim, McIntosh, Fameuse, King, Tolman, Baldwin, Spy, Stark, North Star.

GEORGIAN BAY DISTRICT.

(Including northern portions of the Counties of Grey and Simcoe, bordering on the Georgian Bay.)

J. G. Mitchell, Clarksburg.

Astrachan, Duchess, Gravenstein, St. Lawrence, Alexander, Wealthy, Twenty-Ounce, McIntosh, Greening, King, Baldwin, Spy.

LAKE SIMCOE DISTRICT.

(Including the northern and eastern sections of Simcoe and northern sections of York and Ontario bordering on Lake Simcoe.)

G. C. Caston, Craighurst.

Duchess, Peerless, Alexander, Wolf, Blenheim, Pewaukee, Stark, Baxter, Fallawater, Fameuse, Seek, and the following if top-worked on hardy stocks: Greening, King, Ontario, Baldwin, Spy.

GUELPH DISTRICT.

(Including the high inland Counties of southwestern Ontario, *i.e.*, Wellington, Waterloo, northwestern section of Perth, south part of Grey, Dufferin, and northwest section of Peel and Halton.)

Prof. J. W. Crow, O.A.C., Guelph.

Apples: Duchess, Alexander, Wealthy, Fameuse, McIntosh.
Crab Apples: Whitney, Martha.

LAKE ONTARIO DISTRICT.

(Including the southern portions of the Counties bordering on the Lake Ontario shore from Toronto to Trenton.)

Elmer Lick, Oshawa.

Gravenstein, McIntosh, Fameuse, Blenheim, Greening, Baldwin, Spy.
(If further varieties are required add Golden Russet (for wet spots), Cranberry, Fallawater, Stark (liable to be overplanted).

W. H. Dempsey, Trenton.

Duchess, Gravenstein, Alexander, Fameuse, McIntosh, Greening, Baldwin, Spy, Ben Davis, Stark.

ST. LAWRENCE VALLEY DISTRICT.

(Including the valley of the St. Lawrence River from Kingston to the eastern boundary of the Province.)

Harold Jones, Maitland.

Duchess, St. Lawrence, Alexander, Wolf, Wealthy, Scarlet Pippin, Fameuse, McIntosh, Baxter, Tolman, Golden Russet.

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Ottawa District.

(Including the Ottawa Valley and the eastern portion of the Province not elsewhere enumerated, south of latitude 46 deg.).

W. T. Macoun, Horticulturist, Central Experimental Farm, Ottawa.

Apples: Transparent, Lowland Raspberry, Duchess, St. Lawrence, Wealthy, Alexander, McIntosh, Fameuse, Wolf, Milwaukee, Baxter, Scott.
Crab Apples: Whitney, Martha, Hyslop.

Algoma District.

(Including the islands of Manitoulin and St. Joseph, and a limited portion of the northern and eastern shore of the Georgian Bay.)

Chas. Young, Richard's Landing.

Apples: Transparent, Charlamoff, Astrachan, Duchess, Peach, St. Lawrence, Alexander, North Star, Colvert, Gideon, McIntosh, Winter St. Lawrence, Wolf, Baxter, Longfield, Louise, Wealthy, Patten.
Crab Apples: Whitney, Hyslop, Isham.

Site of the Orchard.

The large inland lakes surrounding the southern portion of this Province have a wonderfully ameliorating effect upon the climate for some distance from their shores, and as a rule our most extensive commercial orchards are in proximity to these large bodies of water. There are, however, in the interior many localities quite as favorable for fruit growing, but in such locations the question of site and exposure has to be more carefully considered. The site usually selected for the orchard is one near the buildings, which may be all right if these are on the highest ground, for such grounds are not only best drained but are least liable to untimely frosts. Good atmospheric drainage is often quite as important as good water drainage, and cold air, like cold water, runs down hill. Only a few feet of elevation above a wide adjoining area may be sufficient to enable trees in full bloom to escape a frost which destroys the crop on the lower level. On level lands there is practically no atmospheric drainage and the orchardist must take his chances and make the best of it.

Exposure.

Where the land is rolling, and there is a choice of exposure, the situation should be carefully considered, for in many cases this may be the difference between success and failure. As to which is the best exposure, depends largely upon the surroundings. In proximity to large bodies of water the best exposure is toward the water. In localities subject to late spring frost the safest exposure is towards the north, as this helps to retard the period of bloom till danger of frost is past. On a northern exposure trees are less likely to suffer in times of severe drouth, and there is also not so much injury from sun scald, a most serious trouble in northern localities. For the reasons given a northern or eastern aspect is, as a rule, preferable to a southern or western one, and also because there is less exposure to our strongest prevailing winds, which come from the south-west.

Windbreaks.

Protection from the prevailing winds is another matter that requires due consideration. The shelter accorded by a high hill or natural belt of timber is perhaps the ideal one, but when these do not exist, the planting of a windbreak is often necessary. The best trees for windbreaks are some of the evergreens, such as Norway and White Spruce, the Austrian and Native White Pines. The Norway Spruce is most used because it is a

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rapid grower, and the young trees may be obtained very cheaply. The windbreak should be planted at the same time as the orchard; it will then be effective by the time the trees come into bearing. A single row may be sufficient, although in very exposed places, a double row, with the trees set alternately, is preferable. The trees should be at least six or eight feet apart, and even ten or twelve feet is better when the trees grow up. The trees should not be planted nearer than forty feet from the first row of apple trees, as if planted too near drifts of snow may cause injury in winter, and insects are more troublesome in summer where there is not a good circulation of air. The trees in the windbreak should be well cultivated, the same as the trees in the orchard, until they become well established. Neglect of this is the main cause of failure in setting out windbreaks.

The Soil and its Preparation.

The apple tree readily adapts itself to a great variety of soils, yet there are certain kinds upon which it does much better than others. Light sandy soils are usually deficient in plant food, and are not retentive of it when fertilizers are applied to them. On the other hand, heavy clay soils may contain plenty of plant food, but they are difficult to work, and unless very carefully managed bake so hard that the tree will not thrive upon them. The ideal soil is a happy mean between these extremes, a friable loam. It may be called a sandy or a clay loam, as either sand or clay predominates in its composition, and is all the better if of a limestone formation upon an open subsoil.

One of the first requisites in any orchard soil is good drainage. Fruit trees will not thrive upon undrained soil. If the land is not naturally well drained, it should be thoroughly underdrained.

Good preparation of the soil previous to planting is very essential. Trees set on unprepared soil are seriously handicapped at an important stage of their life and often they never overcome it. Land which has been exhausted by grain production is in poor condition for the growing of trees, although it may be greatly improved by growing and plowing down two or three crops, such as rye, clover, or vetches, as a green manure. Probably no other crop leaves the ground in better mechanical condition for the growth of trees than clover. Its roots penetrate the soil deeply and leave it well filled with vegetable matter or humus.

There has been much diversity of opinion regarding the value of subsoiling in preparing the land for trees. But there is little room for doubt that it is of much benefit on land where the subsoil is hard and impervious to water. The subsoiler should follow in the furrow of the ordinary plow, loosening the subsoil as deeply as possible. Where this is not done, clover roots are the next best thing as subsoilers.

The preparation of the ground for planting should begin by a good deep plowing in the fall, and it would be all the better if it could be ribbed up as is now frequently done in preparing ground in the fall for spring seeding. This insures good surface drainage and quick drying of the ground in the spring. All that would then be required in the spring would be to harrow down the ridges and loosen up the ground as deeply as possible with a spring tooth cultivator.

Planting.

Great care should be taken and good judgment shown in laying out the orchard and in planting the trees.

The proper distance apart for planting depends altogether upon the ultimate size which the trees may attain, which in turn depends upon the variety, the soil, and the locality. The varieties grown in our most northern orchards seldom spread more than twenty or twenty-five feet, while the kinds grown in the more favored apple sections of Southern Ontario often have a spread of forty feet. The best guide to intending planters is to observe carefully the distances required for full grown apple trees in the neighborhood. In southern Ontario this will be found to be from thirty-five to forty feet, throughout central Ontario thirty to thirty-five feet, while in the northern sections,

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where only the hardiest kinds are grown, tweny-five feet will be found quite sufficient. It is wise to allow plenty of space, so that there will be no crowding when the trees have reached their full size. Planting too close is a far more frequent and serious mistake than planting too far apart.

A plan quite frequently adopted, particularly in some of the large American orchards, is to use some of the small-growing early-bearing varieties as fillers between the large-growing varieties. The Duchess, Ontario, and Wagener, for example, are planted alternately with large growing kinds, such as Baldwin, Greening, and Spy.

In such cases, the large-growing kinds are set at the maximum distance apart, and the smaller kinds between them. By the time the larger kinds begin crowding, the smaller ones will have paid for their keep and that of the others, and can be cut out to make room for the larger trees. The greatest objection to this plan is the danger that the fillers may be left so long before they are removed that the value of the whole orchard may be impaired.

There is a diversity of opinion as to the best time for planting, although it may be done successfully any time when the tree is dormant, either in the spring or autumn. In favorable localities and with hardy varieties it may be done quite as well one season as another, but for general planting the spring is the safest time in our rigorous climate.

The trees should be planted in rows as straight as it is possible to make them. Straight rows add not only to the appearance of the orchard, but to the convenience of cultivation. One of the best means of getting the rows straight is to stake out the position for each tree before beginning to plant.

Great care should be taken to prevent the roots of the trees drying while they are out of the ground. If it happens to be hot and windy at the time of transplanting, it is a good plan to puddle the roots in soft mud as soon as they are taken from the packing box or trench, and in carrying the trees about the orchard it is well to keep the roots covered with a wet blanket or piece of old carpet.

The hole for the tree should be wide enough to hold the roots without cramping or crowding, and should be deep enough to admit of a few inches of fine mellow surface soil being filled in the bottom, and still have the roots an inch or two deeper than they were in the nursery row. The roots should be spread out in their natural position and should be covered with moist mellow surface soil. It is well, in digging the holes, to have the surface soil placed at one side and the subsoil on the other, so that in refilling, the surface earth may be placed next the roots and the subsoil left for the top. If the soil has been properly prepared it is seldom necessary to water the roots at the time of transplanting, but care must be taken to ensure the soil moisture from below coming up to the roots. This may be done by tramping the earth firmly as soon as the roots are well covered, and leaving only the top soil untramped to act as a mulch and retain the moisture below. The neglect of this firming of the soil around the roots is one of the most common causes of failure in the transplanting of trees. If watering is necessary, a small pailful poured in as soon as the roots are nearly covered, is of more use than a half dozen on the surface after the planting is finished.

All torn, bruised, or injured roots should be cut back, with smooth cuts, to sound wood. Smooth cuts callous over quickly and new roots are the more readily sent out. Trees obtained from the nursery, no matter how carefully they may have been taken up, have lost the greater part of their root system, and in order that they may make a satisfactory growth when transplanted the top must also be cut back to a similar extent to restore the balance. This cutting back, however, can be most satisfactorily done after the trees are planted, when they are held firmly by the soil, and more careful attention can be given to shaping the head of the young tree. Closely associated with the heading back of the top at the initial pruning of the tree, is the question of determining the height at which the head should be formed. On this, as in many other points of orchard management, there is a variety of opinions. Some prefer high heads, because of the greater convenience for cultivation and working underneath; while others prefer them low, because of the greater convenience in pruning, spraying, and harvest-

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ing. There are other reasons, however, why low-headed trees are preferable; in exposed locations the trees and crop are less likely to suffer from violent winds, and in northern localities the trees with short trunks and low-spreading branches are much less subject to injury from sun scald, the most serious tree trouble of the north. It is better for the planter to get two-year old rather than three or four-year old trees, so that he can start the head at whatever height he wishes. In this connection it may be stated that tree trunks do not lengthen, except by pruning off the lower branches, so that at whatever distance from the ground the lower branches are left, that will be the permanent length of the trunk.

Three branches are enough to leave to form the main limbs or framework of the tree top. These should be evenly spaced around the trunk to give a well-balanced and symmetrical top, and they should also be placed on the trunk so as to distribute evenly the weight of the top and avoid bad crotches which are liable to split down with the weight of the crop. It is particularly important at this stage that great care should be taken to train the young tree in the way it should go, and much can be done in training and directing growth by heading back to buds pointing in the direction we wish the new branch to take.

Care of the Orchard after Planting.

In a newly-planted orchard the trees occupy but a small portion of the land, and they cannot be expected to give any returns for at least five or six years. It is advisable, therefore, that some other crop be grown in the orchard which will pay for the labor spent upon it till the apple trees come into bearing and require all the space. It is by injudicious cropping, however, that young orchards are often most seriously injured. It should not be forgotten that the apple trees are the first consideration, and that whatever cropping is done in the orchard must not interfere with them in the least.

In some cases the spaces between the trees may be planted with small fruits, such as raspberries, currants, or gooseberries, but these should not be planted within nine or ten feet of the tree, nor should they occupy ground more than six or seven years. If fillers are used in the orchard intercropping should be discontinued in four or five years.

Hoe crops, such as corn, roots, potatoes, etc., have generally been recommended as the best to grow in the orchard, because of the opportunity they afford for cultivation. This may be all right as far as it goes, but these crops draw heavily upon the plant food in the soil and return very little in the way of roots or plant residue. If such crops are successively grown for several years, they are almost sure to seriously deplete the soil fertility, unless extra care is taken to maintain it by the application of manure or fertilizer. Probably on the whole the least objectionable cropping is a well arranged rotation of crops, in which clover and hoed crops alternate frequently enough to keep the ground in good condition. Some of these crops harbor mice, and whenever such occur in the rotation precautions must be taken at the approach of winter to protect the trees from their ravages.

During all this intercropping a strip in which the trees are growing must be left for regular cultivation, and this strip should be widened each year as the trees increase in size. No cropping should be attempted under the head of the trees, and intercropping should be discontinued as soon as the trees require all the space.

Cultivation.

Cultivation improves the physical condition of the soil by breaking up the soil particles and presenting a greater feeding surface to the roots. By warming and deepening the soil, it permits of a greater depth of feeding area. Every soil particle is surrounded by a thin film of moisture, consequently the finer the soil particles the greater the surface area to hold moisture. A dry earth mulch or dust blanket on top

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checks the evaporation of moisture from below. Cultivation renders plant food more readily available by promoting nitrification and the decomposition of organic matter in the soil.

Knowing this to be the case, many growers have given thorough cultivation a fair trial, and have satisfied themselves that for most sections of Ontario clean cultivation with cover crops is more profitable than sod. There are indeed few cases where sod is more desirable than cultivation; these are where the soil is fertile and contains an abundant supply of moisture.

As soon as possible after the trees are set, a strip on each side should be cultivated to loosen up the soil which has been tramped down during planting. Each year this strip should be widened, so that no crop intended for harvesting is grown beneath the branches of the trees.

Cultivation should begin as early as the ground is dry enough in the spring. The first tool to be used in most cases is the plow. It is well to plow the land about five inches deep during the first few years after setting to encourage deep rooting. As the trees get older the depth of plowing should be gradually lessened, until by the time the orchard is in full bearing, three to four inches is sufficient.

Cover Crops.

The value of growing cover crops in the orchard is being more appreciated every year by fruit growers who in times past viewed with alarm the injury which occurred from root killing where the soil was bare in winter. A cover crop is a covering of vegetation in the orchard during the latter part of summer and early winter, and is useful in many ways, of which the following are some of the most important: (1) A cover crop, by adding a large amount of fibre to the land, prevents hard soils from cementing or puddling. (2) On bare and rolling land, where the rains quickly run off and snows blow off the high portions, a growing crop tends to hold these until they have time to soak into the soil. (3) Land covered by a growing crop dries out more quickly in the spring, owing to the transpiration of moisture through the leaves, and consequently may be plowed under earlier in the season than land which is bare. This is a very important point, as it enables the orchardist to gain several days in the busy season of spring. (4) Ground covered with vegetation will hold the snows in winter and thus prevent deep freezing, thereby avoiding the liability of root killing. (5) A cover crop affords the most economical means of furnishing a supply of humus in the soil. (6) The roots of a cover crop assist the tree roots in rendering available certain mineral plant food in the soil. (7) A large amount of plant food is liberated in the soil after the tree growth has ceased. This is taken up by the growing crop and held in a readily available form for the following season. (8) Leguminous crops, such as clover, vetch, alfalfa, peas, and beans, by virtue of certain bacteria which form nodules on the roots, are able to assimilate nitrogen from the air. As nitrogen is one of the most expensive fertilizing elements, the value of this class of plants cannot be too highly appreciated. (9) Last and of most importance in some districts it takes the moisture from the soil in the fall and causes the trees to ripen up earlier.

Cover crops should be sown about the middle of July, so that they may make a good growth the same season, and in the colder parts of the Province, the seed may be sown during the first week of July, as the season is shorter than in the more favored sections. It is also wise to check the growth of the trees about this time, so that they may mature their wood before winter sets in. The thorough tillage which should have been practised up to this season leaves the ground in the best possible condition to give the young plants a start. The crop should be plowed under as early in the spring as possible, and cultivation should begin at once. If the crop is large and the soil rather dry, this is imperative, as the large amount of vegetable matter turned under seriously interferes with capillary action and leaves the surface soil unduly dry.

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That a cover crop may be of the greatest value, it should be capable of withstanding the winter and continuing its growth next spring. This, however, is not a necessity, as many of the ordinary crops which will not live through the winter are valuable for this purpose.

Different soils require different kinds of crops. This has led to a division of cover crops under several classes. The most important are the nitrogen gatherers, which through the agency of the nodules on the roots can make use of the nitrogen of the air. Such plants as clover, vetches, alfalfa, peas, and beans, belong to this class, and should be used where the soil is deficient in nitrogen. Another class is known as the potash liberators, such as turnips and rape, which, although they do not add anything to the soil, as do the leguminous plants, yet change the form of the mineral potash so that it may be more readily acted upon by the roots of succeeding crops. Then there is a third class, commonly grown, such as rye, oats, and buckwheat, which are valuable chiefly on account of the humus formed by their development.

Hairy Vetch, sown at the rate of thirty-five pounds per acre, forms a very close mat over the ground. This is a valuable crop owing to the fact that it collects nitrogen, lies close to the ground so that it does not inconvenience the pickers when gathering the fruit, and also withstands the cold winter and continues its growth early in the spring.

Red Clover and Mammoth Clover, sown at the rate of twenty-five to thirty pounds per acre, are about equal in value, make a fair growth, are low growing, and winter well on drained soil.

Crimson Clover has not made quite as good growth as the red or the mammoth, nor will it stand the winter in the colder sections, which is a serious disadvantage. Best sown thirty to thirty-five pounds per acre.

Alfalfa, or lucerne, is one of the best leguminous crops for dry land. It makes a good growth and winters well. There is a mistaken impression that alfalfa will not make sufficient top the first season. Thirty pounds of seed per acre, sown in July, will give a good stand the same season.

Rape has given good results in the colder sections. It makes a heavy growth of stiff stems, which, although nearly all killed in winter, stand up well enough to hold the snows. Rape can scarcely be recommended for fruiting apple orchards, as it remains wet the greater part of the day, making the work of harvesting very unpleasant. It may be used to good advantage in the rotation, especially if few fruits are to be harvested.

Rye, the favorite crop of many growers, gives a fair amount of top and winters well. One advantage of rye is that it may often be grown on lands not in a physical condition for the growth of clover. In this way humus may be added to the soil, and conditions made more favorable for the growth of clover.

Maintaining Fertility.

The maintenance of fertility is more frequently neglected in the orchard than on any other part of the farm. Trees, even on poor land, will produce fruit, but it is only on soils where fertility is maintained that paying crops are produced. Each year that fruit is harvested some plant food is removed. If profitable crops are to be expected the supply of plant food in the soil must be maintained.

The most essential elements for the production of fruit are nitrogen, potash, phosphoric acid, and lime. Nitrogen encourages leaf and wood growth, which are essential to the development of the tree and to the production of the best quality of fruit. Potash is an essential constituent in the growth of fruits. It constitutes a large proportion of the ash of the wood and more than 50 per cent. of the ash of the fruit, and is also associated with the development of flavor in the fruit. Phosphoric acid is essential to the development of the tree and the proper ripening of the fruit. Lime is not in itself an essential element, but is necessary in liberating plant food.

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Barnyard manure supplies nitrogen, potash, and phosphoric acid, and improves the physical condition of the soil. Cover crops may take the place of barnyard manure to improve the physical condition of the soil, and the leguminous ones may add all the nitrogen required. Concentrated fertilizers or commercial plant foods may be used in conjunction with cover crops to supply all the plant food necessary for the growth of trees. In the use of commercial fertilizers it is well to proceed cautiously, and, by carefully conducted experiments, ascertain what elements of plant food the soil may be deficient in, and what amounts it may be necessary to apply to get the best results. Unleached wood ashes contain a small quantity of phosphoric acid, seldom exceeding 1½ per cent., a larger amount of potash, varying from 5 to 7 per cent., and also a certain amount of lime. Where pure wood ashes can be procured at a price not exceeding ten cents per bushel, they afford an economical source of plant food. An application once in two or three years will usually give excellent results, especially on light soils which are most lacking in potash. Muriate of potash is another economical form in which to obtain potash. Phosphoric acid may be purchased in the form of superphosphate. Nitrogen may be procured in the form of sodium nitrate, but leguminous cover crops furnish a much cheaper source of this essential but costly element.

Pruning.

The object of pruning is to form a vigorous and evenly balanced tree, which will produce annually a paying crop of good-sized, well-colored fruit. Unpruned trees produce many small-sized unsalable apples. Pruning lessens the number of apples per tree, but at the same time increases the size and improves the quality of those produced. A heavy crop of good-sized fruit is not so serious a drain on the vitality of the tree, nor on the fertility of the soil, as the same weight of smaller apples would be, for it is the production of the seed which makes the greatest drain on the tree and soil.

Pruning should be practised every year without fail from the time the tree is planted. In this way the operation is never a severe one, and the removal of the large limbs becomes unnecessary. Limbs growing too strongly in any particular direction, which are liable to upset the balance of the tree, should be headed back. Where two limbs cross, one of them should be removed. Branches growing across, from one side to the other, should be cut out. Care should be taken to leave sufficient twigs in the centre to protect from sun scald. Much may be done in directing growth by heading back to a bud pointing in the desired direction. It is while the trees are young that the greatest care in training is required.

A properly pruned apple tree should be open enough to admit sunlight and permit of free circulation of air. Its lower branches should be trained high enough to admit of easy cultivation, yet the top should not be so high that spraying and harvesting are rendered difficult. Varieties differ more or less in their habit of growth, and, while it may be advisable to modify this to some extent, it is not well to attempt to change it unduly. Long bare branches should be avoided, and the formation of fruit spurs should be encouraged on all parts of the tree.

The best time for pruning is just before growth begins. Wounds made at that season soon heal over. It is not well to prune when there is frost on the wood. Pruning while the tree is dormant tends to increase the growth of wood. Summer pruning encourages the formation of fruit buds, but it is not advisable to do much of it, as the removal of any considerable amount of the leaf area tends to check the vigor of the tree. Pruning by the removal of buds may be practised at any season of the year.

The thumb and finger may be used for the removal of sprouts and buds during the summer. A pair of small pruning shears will remove all twigs less than half an inch in diameter. For larger limbs a sharp fine-tooth saw is needed. Make all cuts as smooth as possible and close to the main stem. When a large limb has to be removed, it may be advisable to cut twice, the first some inches out to avoid splitting, and the second to shorten the stub. A common mistake is the leaving of long stubs which

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cannot heal over before rot begins. Where it is necessary to remove large limbs, the wounds should be covered with grafting wax or thick lead paint to prevent the entrance of spores which cause decay.

Grafting.

Grafting is the operation of inserting a scion into a stock, usually for the object of changing the variety of fruit produced. Trees bearing undesirable fruit may be top-grafted with some valuable variety. Many choice half-hardy varieties may be successfully grown by top-working on some hardy stock. Especially desirable characteristics in any variety may be perpetuated by grafting. Individuality is quite as marked in plants as in animals. A certain tree may possess some desirable quality, and this may be preserved and perhaps improved upon by selection. It is advisable when cutting scions to select from those trees which have the desirable characteristics most strongly marked. Nurserymen, as a rule, do not pay sufficient attention to the source from which they secure their scions. The individual orchardist may greatly improve his plantation by top-grafting with scions from a tree having the desired qualities most strongly marked.

Grafting is usually performed in the spring. It is essential that the cambium layer of the scion and stock be in contact on at least one side. From this mucilaginous layer, lying between the wood and the bark, the new cells are formed which in time unite the parts and cover the wound. It is necessary to cover the wounds made in outdoor grafting to prevent the entrance of rot-producing spores. For this purpose wax is generally used.

A good grafting wax may be made by melting together four pounds resin, two pounds beeswax, and one pound tallow. Cool by pouring into a tub of water. Then work up into bars or balls which may be kept in any cool place until required. To economize wax, cloth is sometimes dipped into the hot wax, making wax-cloth. This is more difficult to use than pure wax. The wax may be melted and carried in a glue pot and applied with a brush, or, as is more commonly done, it may be kept in water warm enough to keep the wax pliable so it may be readily applied by hand. It is well to keep the hands greased to prevent the wax from adhering to the fingers.

There are two common methods of top-grafting: (1) Whip or tongue grafting which is practised upon small branches and young trees; (2) Cleft grafting, which is usually performed on branches from one-half to two inches in diameter.

In whip grafting the stock is cut with a bevel about one inch long, and the scion cut to fit that bevel. Both bevels are cut into slightly and the tongue of one fitted into the notch of the other. The cambium layers must be in contact on at least one side. After the scion is set the wound should be covered with wax or similar substance to exclude the air.

Large trees should not be entirely changed over in one year. The first year select the main branches; the second year part of the remainder, and finish the third year. In this way much of the annoyance caused by the growth of water sprouts is avoided.

When cutting off large branches for cleft grafting it is wise to cut twice, making the first cut a few inches above the position chosen for the scion. Then cut off the stub at the desired point, and avoid the danger of tearing the bark. With a chisel or grafting iron split the branch just far enough to admit the scions. Too deep a split weakens the stock, and the scions will not be held sufficiently firm. It is well to avoid grafting two horizontal limbs, one directly above the other. The tendency of new growth is upward, and the growths from the lower one will interfere with the upper. In branches, other than those growing perfectly upright, the split should be made parallel to, rather than at right angles to the ground.

The scion should be made wedge-shaped, with bevel about one inch long, starting at each side just at the base of a bud. Make the scion three buds long, cutting off just above the third bud. It should be cut a little thicker on the side next to the bud, so that the stock may pinch tightly on that side to insure a close contact of the cambium layers.

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Open the cleft with the wedge end of the grafting chisel and insert one or two scions, as may be thought necessary. Place the lower bud of the scion to the outside. Do not force the scion down, but open the cleft by enough leverage on the chisel to admit the scion freely. Setting the scion with the top pointing slightly outward insures contact in at least one point. After setting the scions, cover all wounds with wax.

It is sometimes necessary to remove part of the watersprouts, which usually start during the summer, to give the scions room for proper development. By the following spring the scions should have made sufficient growth to require all space in that part of the tree, and all other growth should be removed.

Sun Scald.

Sun scald is an injury to trees which occurs most frequently in the northern districts. It is most serious on young trees, but may also affect the upper side of the large branches in older trees. It is caused by the action of the hot sun on the trunk and branches in the early spring. The first indication is an unhealthy appearance of the bark on the south and south-west sides of trunk and upper side of large branches, the affected parts soon turn brown, then black, and finally die.

In districts where sun scald is apt to occur, it is well to head the trees low and incline the stem slightly to the south-west. In this way the branches afford some shade to the trunk. Anything which will shade the trunk in early spring will prevent the injury. For this purpose the most convenient of the following materials may be used: cornstalks, birchbark, building paper, or a veneer of thin wood, such as is used in basket making. The large branches of old trees should receive natural protection from the small branches and twigs of the top. For this reason severe pruning of the top is not advisable in northern districts.

When trees are badly affected they usually die, but where the injury is slight, and is noticed soon after it occurs, treatment is practicable. Cut away the injured parts, and cover the wound with grafting wax or some material which will keep the wood from drying out. If the tree is healthy and vigorous, the annual growth spreading in from the sound parts soon repairs the injury.

Protection from Mice.

During the past two or three years, mice have become a serious menace to young orchards. The rapid increase in numbers may be largely accounted for by the indiscriminate destruction of the farmer's best friends, the hawks, that feed largely on mice by day, and the owls, which take up the work by night. By carefully protecting the hawks and owls for a few years, their numbers will again increase, so that the equilibrium of nature may be restored. In the meantime something must be done to protect the trees against the rodents.

Mice seldom harbor in a green crop, and on clean fields they find no protection. They are found chiefly along the fence lines and in old meadows. As there is usually some shelter afforded the mice near orchards, it is advisable to guard against their depredations. In localities where the snow falls early and remains on the ground all winter, the simplest means of protecting the trees is to tramp the snow firmly about the base of each tree early in the winter. Where the ground is not continuously covered with snow during the winter, a mound of earth about the tree is sometimes all that is required to divert the runways of the mice. Building paper cut into strips which will reach about one foot high when tied about the trunk of the tree in autumn has been found to be both a cheap and an effective preventive.

Badly girdled trees usually die. When the part girdled is small and is covered before the wood dries out with grafting wax or other substance which will protect the inner tissues, the tree may be saved. If the girdled part extends entirely around the tree, it will be necessary to establish some connection between the cambium above and below the injury. This may be done by bridge-grafting. For this purpose use long scions

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cut to a bevel on each end. Insert one end above and the other end below the girdle, making sure that the cut surfaces are in contact with the cambium layer. A sufficient number of these scions should be put in to convey the cambium from the top to the roots and all cut surfaces exposed should be covered with wax.

Picking.

Apples should be carefully picked by hand, without breaking the skin or bruising the fruit in any way. Summer varieties for immediate home use or special local trade should be allowed to ripen on the tree; but if intended for distant markets or storage they should be picked when fully mature, but before they have commenced to mellow. Winter varieties should hang on the tree until they have reached full size and have taken on good color. Apples picked while still immature as a rule keep longer than if allowed to fully ripen on the tree, but they do not develop the full color nor the best quality. No sharp distinction can be made between green and mature, or between fully mature and over-ripe fruit; one blends imperceptibly into the other. Experience teaches at what stage to harvest the crop in order to secure the highest quality and best keeping properties in the fruit. Sometimes, with summer varieties, it is necessary to go over a tree twice, picking the most mature specimens first and leaving the remainder for a week or two in order that they may more perfectly develop. Round bottom baskets or pails should be used for picking, and it is better to have them lined with cloth to prevent bruising the fruit. Fruit should not be piled on the ground, but should be placed at once on the sorting table or be placed in boxes or barrels for removal to the packing house. The apple should be picked with the stem on but without breaking off the fruit spur, as is likely to occur if the fruit is picked too green. Spring waggons should be used to convey the fruit to and from the packing house.

When the trees have been properly pruned, the fruit may all be harvested from ladders. A short step-ladder is convenient for the underside and low branches of the tree. For the upper branches light cedar ladders of suitable length will be found very convenient. Extension ladders have been praised very highly in the past, but as they are both awkward and cumbersome, practical growers are abandoning them. The practice of climbing through the tree to gather the fruit, and letting the baskets down to the ground by means of a rope, is out of date, and is not practised in commercial orchards. Inexperienced pickers often lose a great deal of time by not picking clean as they go, making it necessary to carry the ladder back and forth. Each time the ladder is moved all apples in reach should be picked.

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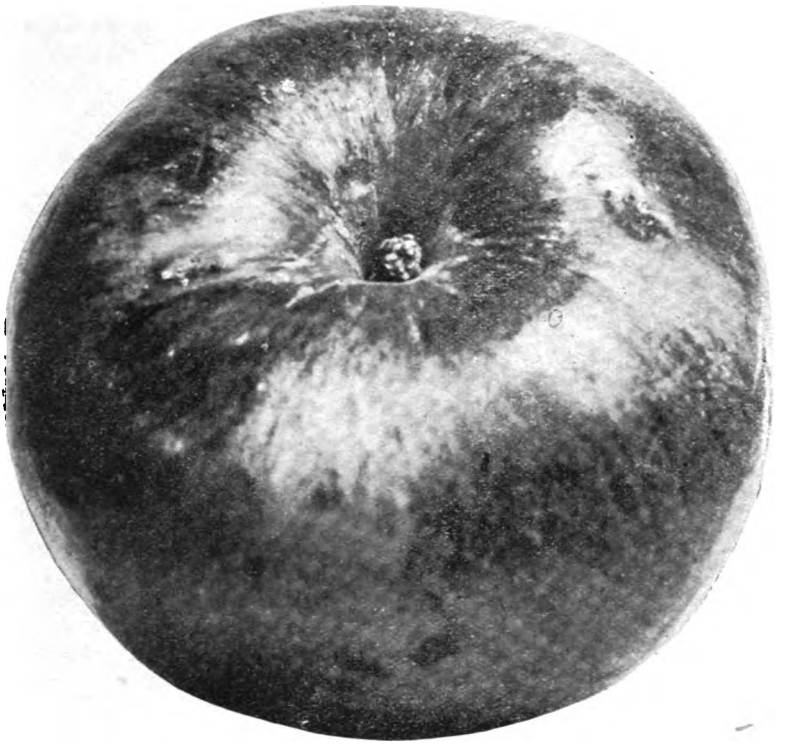
DESCRIPTION OF VARIETIES

ALEXANDER (*Emperor Alexander*).



ALEXANDER.

ORIGIN: introduced into England from Russia in 1817.

TREE: hardy, spreading, vigorous, productive; bears early.

FRUIT: very large size; form round, ovate, conical; skin greenish yellow, russet dots, streaked or splashed with red; stem ¾ inch long, set in a deep russeted cavity; calyx large, nearly closed, set in a deep, even basin.

FLESH: yellowish white; crisp, not very fine, moderately juicy; flavor subacid, pleasant.

QUALITY: dessert, fair; cooking, good.

VALUE: home market, first class; can be successfully shipped to Great Britain in cold storage.

SEASON: September to November.

ADAPTATION: quite general, the tree being hardy.

SECTION OF ALEXANDER.

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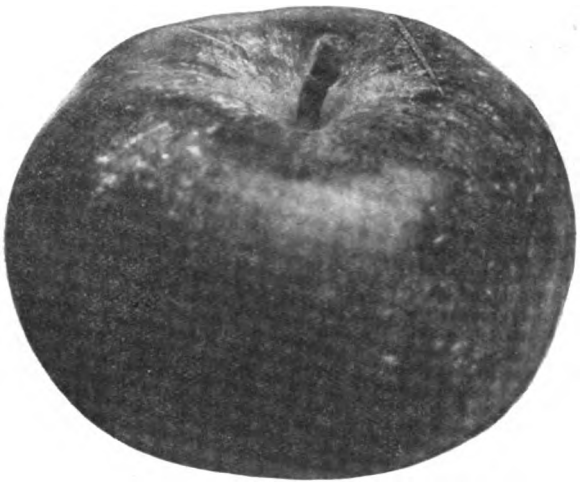
ASTRACHAN (*Red Astrachan*).



ASTRACHAN.

ORIGIN: imported from Sweden to England in 1816, and widely planted in Ontario for a summer market apple. Scarce another apple of its season equals it in beauty of appearance, for in addition to its rich crimson color, it is often covered with pale white bloom. Selected fancy grades of this apple are usually in good demand in our home markets.

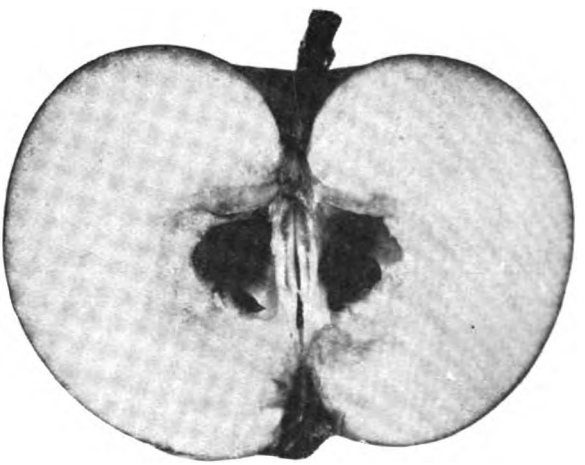
TREE: upright; very vigorous; begins bearing early; very productive.

FRUIT: medium to large; round, narrowing towards apex; skin, deep crimson when exposed to sun, yellowish-green in shade, often covered with a thin, whitish bloom; stem, stout, three-quarter inch long, in a deep cavity; calyx closed in a shallow, somewhat irregular basin.

FLESH: white, crisp, juicy, tender, becoming mealy when over-ripe; acid, almost too tart to be counted very good for either dessert or cooking.

VALUE: first class as an early summer apple.

SEASON: August.



SECTION OF ASTRACHAN.

ADAPTATION: In Niagara district perfectly hardy and productive. Not considered profitable in Lake Simcoe district by some growers.

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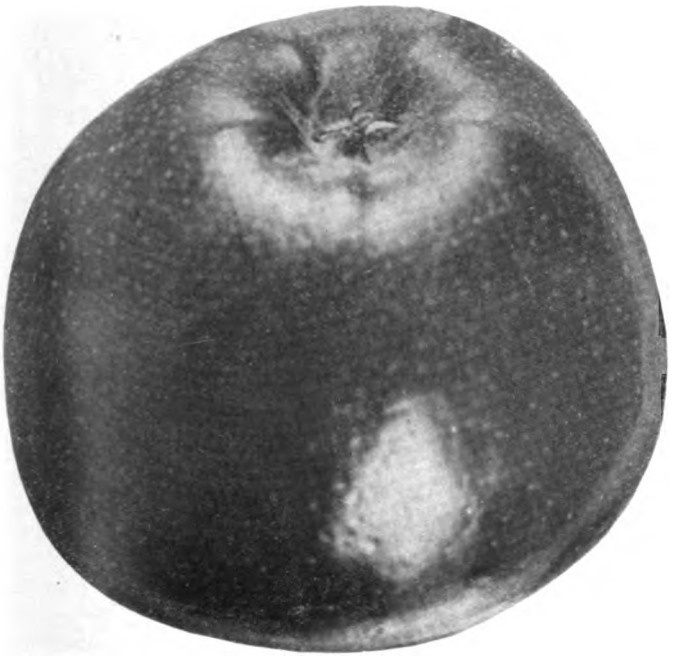
BALDWIN.

ORIGIN: The Baldwin originated as a chance seedling in the State of Massachusetts and has been for many years the most popular winter apple for either home or foreign markets. The average yield from full grown trees each alternate year is about eight barrels per tree, and in some instances much larger. Large orchards of this variety have been planted in the apple growing counties of middle and southern Ontario.



BALDWIN.

TREE: not hardy outside the best fruit districts; upright, spreading, vigorous grower, usually very productive.

FRUIT: large, roundish, ovate; skin yellow, shaded and splashed with crimson and red, spotted with some russet dots; stem heavy, three-quarters of an inch long, in a broad often russeted cavity; calyx closed, in a deep plaited basin.

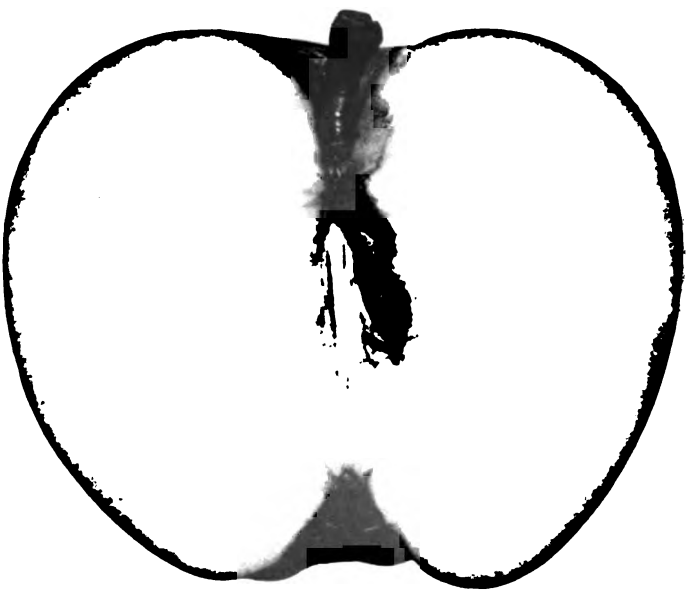
FLESH: yellowish white; tender, juicy; flavor subacid, sprightly, aromatic.

QUALITY: dessert fair; cooking good.

VALUE: market first class, especially for export.

SEASON: November to March.

ADAPTATION: adapted only to the best apple districts where it is one of the most profitable varieties.



SECTION OF BALDWIN.

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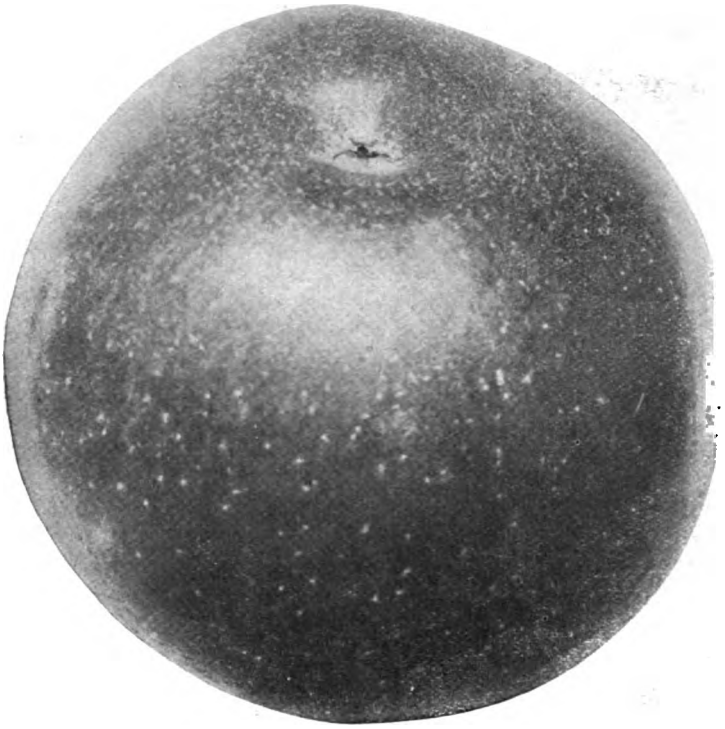
BAXTER (*Larue*).



BAXTER

A fine large red apple, which, however, is inferior in quality to other varieties of its season, such as Tompkins King, McIntosh and Hubbardston.

ORIGIN: with Mr. Larue, near Brockville, Leeds Co., Ontario, but introduced by Mr. Baxter.

TREE: healthy, vigorous, hardy, moderately productive.

FRUIT: size large to very large; form roundish, slightly conical; color red with obscure stripings of dark red, and numerous prominent grey dots; stem half an inch long, in a narrow, funnel form cavity, calyx nearly closed, in a large regular basin.

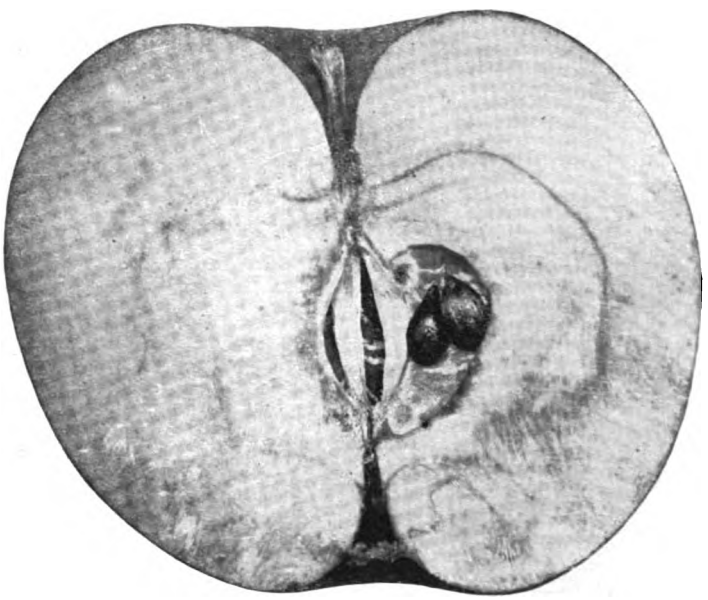
FLESH: yellowish white, often streaked with red; texture moderately firm, not very juicy; flavor slightly acid.

QUALITY: dessert medium; cooking good.

VALUE: home and foreign market, first class.

SEASON: October to January.

ADAPTATION: has proved hardy and profitable in Eastern Ontario and the Lake Simcoe District.



SECTION OF BAXTER.

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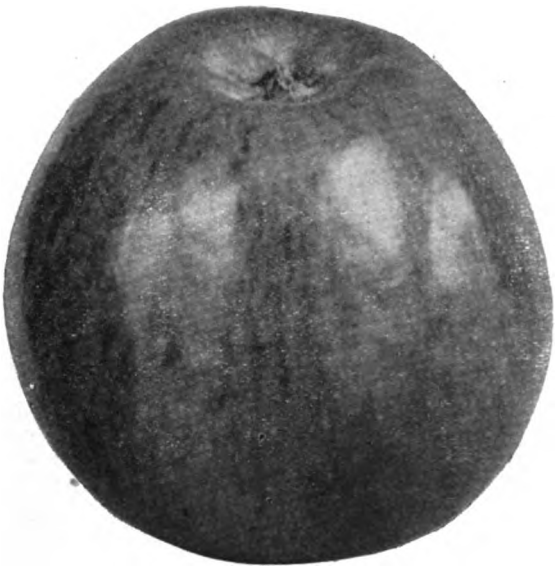
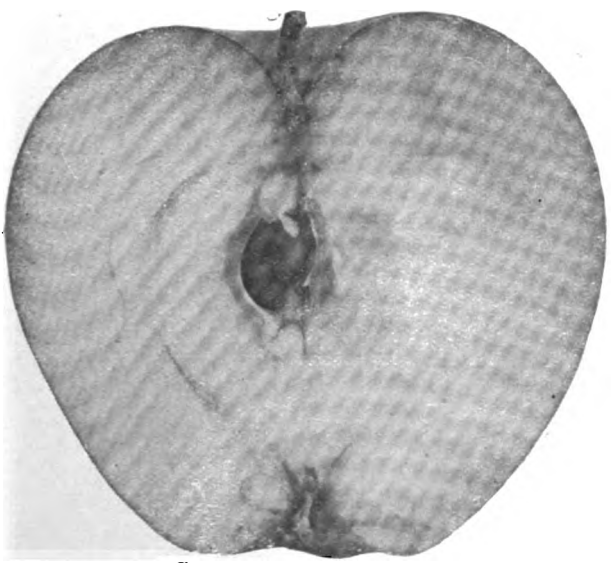
BEN DAVIS.

One of the most popular market apples in the southwestern and western states because of its great productiveness, hardiness, good color and its keeping and shipping qualities. Highly valued by some growers in Canada, but condemned by others on account of its inferior quality. The tree blossoms late and therefore usually escapes damage from late frosts.



BEN DAVIS.



SECTION OF BEN DAVIS.

ORIGIN: variously credited to Tennessee, Kentucky and Virginia. Scions taken from Kentucky to Southern Illinois about 1820.

TREE: spreading, fairly vigorous, very productive, and early bearing.

FRUIT: medium to large; roundish, truncated conical, unequal; color yellow, striped and splashed with red, having scattered aureole dots; stem slender, one to one and a half inches long in a deep cavity; calyx erect, partly closed in a deep, wide basin.

FLESH: white, not very crisp, mildly subacid.

QUALITY: dessert, poor; cooking, fairly good.

VALUE: home market, second class; foreign market, first class.

SEASON: January to May or June.

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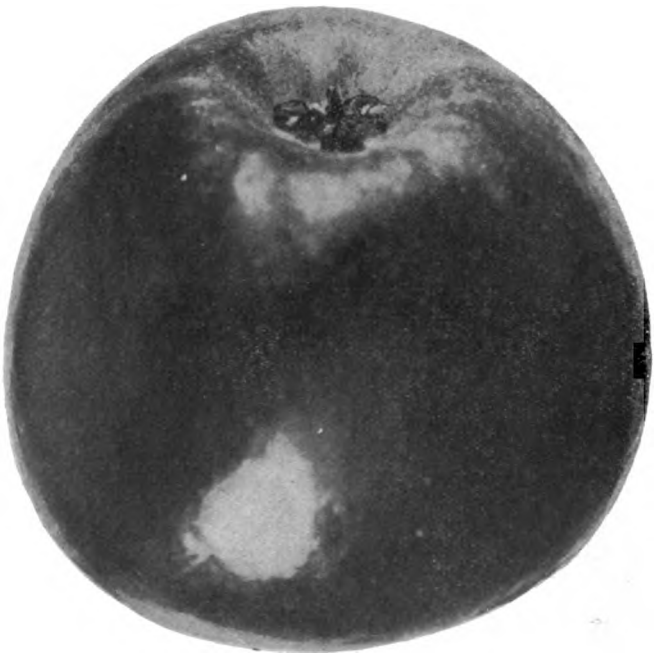
BLACK BEN DAVIS.



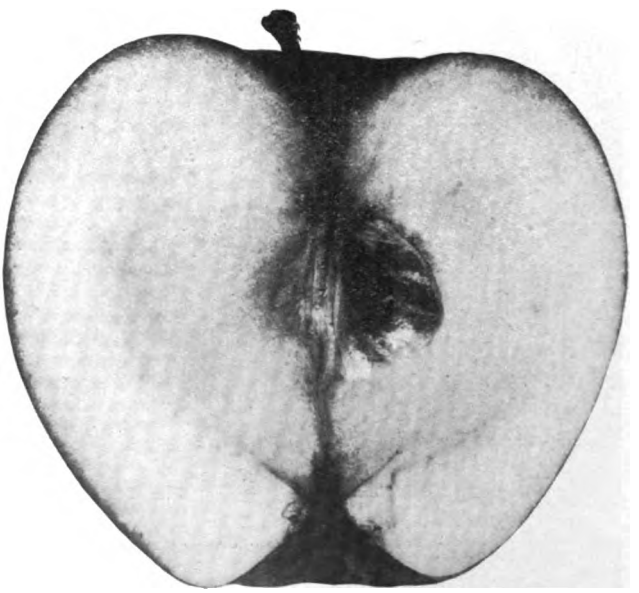
BLACK BEN DAVIS.

ORIGIN: Arkansas, on farm of Rev. M. Black.

FRUIT: large, form much like Ben Davis, the skin also becoming unctuous like that variety; color of skin very handsome, a dark solid crimson, almost black crimson on sunny side; on shaded side the yellow ground color shows through; no true stripes or splashes, but shading varies in depth of coloring; dots distinct, few, minute, yellow; cavity obtuse, medium deep, with stellate russet; stem short; basin deep, abrupt, sharp rimmed, somewhat ribbed; calyx open.

FLESH: yellowish white, moderately juicy, mild, pleasant, subacid, good.

SEASON: winter.



SECTION OF BLACK BEN DAVIS.

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BENONI.

A summer apple little grown in Ontario, and not highly esteemed for commercial purposes.

ORIGIN: Massachusetts.

TREE: spreading, fairly vigorous; hardy; fairly productive. A biennial bearer.

FRUIT: size scarcely medium; form oblate conical; skin rich yellow, blushed with red in the sun with a few scattered bright dots; stem half an inch long in a deep cavity; calyx erect, partly closed in a deep basin.

FLESH: color yellow; texture tender and juicy; flavor rich subacid.

QUALITY: dessert very good; cooking good.

VALUE: market second class.

SEASON: August and September.

BIETIGHEIMER.

A fall apple remarkable only for its great size and beauty. The fruit drops badly.

ORIGIN: Germany.

TREE: habit vigorous, spreading; an abundant biennial bearer; hardy.

FRUIT: size very large, sometimes immense; form round, oblate; skin whitish yellow almost covered with pale red, and having a few obscure stripes and splashes, and numerous whitish dots; stem very short, in a wide, regular shallow cavity; calyx closed in a narrow slightly corrugated basin.

FLESH: white; texture firm, juicy; flavor brisk, subacid.

QUALITY: poor for dessert; fair for cooking.

VALUE: home and foreign market second class

SEASON: September and October.

BLENHEIM.

BLENHEIM. (*Blenheim Orange. Blenheim Pippin.*)

SECTION OF BLENHEIM.

An apple that is constantly gaining in favor with both grower and consumer, because of its size, its beauty, its evenness of form and general excellence for cooking and dessert purposes. It is grown in the counties of Prince Edward, Victoria, Lincoln and elsewhere, and is highly valued as a commercial apple. It certainly deserves to be more generally planted.

ORIGIN: a garden in Woodstock, England, near the residence of the Duke of Marlboro'; shown at a meeting of the London Horticultural Society in 1819, and introduced into France in 1840.

TREE: very vigorous in habit and consequently a scant bearer while young, but a regular and abundant bearer as it grows older; dwarfed on the Paradise stock, the tree becomes an early bearer.

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FRUIT: large to very large on favorable soil; form roundish oblate, slightly smaller at the apex than at the base, very regular; color yellowish, splashed with dull red on sunny side and streaked, and with deep red dots small and distinct; stem short, three-quarters of an inch long, stout, in a large russeted cavity; calyx large and very open, with short segments placed in a large green basin.

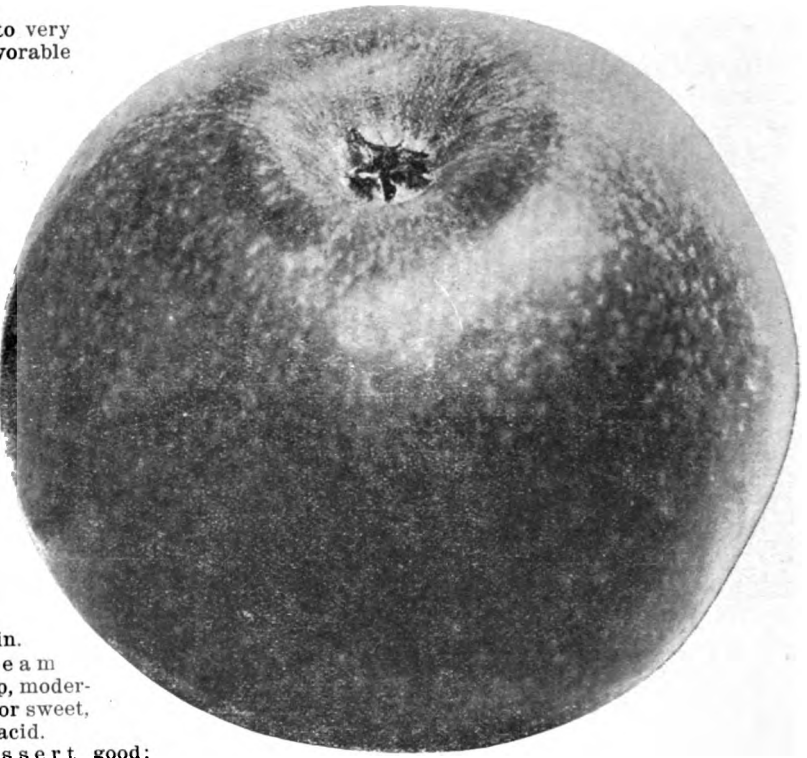
FLESH: cream white, fine, crisp, moderately juicy, flavor sweet, spicy, slightly acid.

QUALITY: dessert good; cooking very good.

VALUE: home and foreign markets, first class.

SEASON: November to January.

ADAPTATION: best apple districts only.



BLENHEIM.

BLUE PEARMAIN.

A variety found in many of the older orchards; not productive enough to be profitable.

TREE: strong, vigorous, healthy; a light bearer.

FRUIT: size, very large; roundish, regular, slightly conical; color, splashes and stripes of dark purplish red over a dull yellow ground, solid red in sun, with heavy blue bloom and distinct white, russet dots; stem three-quarters of an inch long, set in a wide, deep, usually russeted cavity; calyx open in a smooth, shallow basin.

FLESH: color yellowish; texture firm, moderately juicy; flavor mild acid, rich, aromatic.

QUALITY: first rate.

VALUE: not profitable on account of unproductiveness. It is also a poor market apple.

SEASON: November to February.

BOGDANOFF.

A promising apple for the north; not recommended where Spy and Baldwin succeed.

ORIGIN: Imported from Russia for the Iowa Agricultural College by Professor J. L. Budd.

TREE: moderately vigorous; habit upright.

FRUIT: size medium; form roundish, somewhat ribbed; color green or yellowish green, often with faint bronze blush and numerous small white dots; stem short set in a shallow cavity; calyx usually closed in a somewhat furrowed, wrinkled basin.

FLESH: color white; texture tender and juicy; flavor pleasant; subacid.

QUALITY: dessert fair; cooking good.

VALUE: market second class.

SEASON: November to February.

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BOIKEN.

Tested at our Simcoe station since 1896 and esteemed worthy as a commercial apple.

ORIGIN: tree imported from Prussia by Prof. Budd; named after Dike-Warden Boike, of Germany.

TREE: a fair grower; habit willowy, like Golden Russet; an early and abundant bearer.

FRUIT: size medium; form oblate conical; skin smooth, yellow with red cheek and many minute white dots; stem long in a wide, deep cavity; calyx in a wide, wrinkled basin of moderate depth.

FLESH: color white; texture firm, juicy, fine grained; flavor sprightly, refreshing, subacid.

QUALITY: dessert fair; very good for cooking.

VALUE: thought well of at Lake Simcoe Station for market.

SEASON: November to February.

BOTTLE GREENING.

An apple grown in some parts of Ontario for home uses, for which its excellent quality makes it very desirable; it is not recommended for the commercial orchard, because the fruit is rather tender for shipment to distant markets.

ORIGIN: according to Chas. Downing, this variety was found near the border line between Vermont and New York State, and takes its name from a hollow in the original tree, where workmen were accustomed to keeping their bottle.

TREE: vigorous, productive.

FRUIT: medium to large; form oblate, slightly conical; color yellowish with bright red on one side, a thin bloom and a few light dots; stem half an inch long in a deep, funnel-form cavity; calyx nearly closed, in a moderately deep, often slightly furrowed basin.

FLESH: greenish white; texture fine, tender, juicy, almost melting; flavor subacid.

QUALITY: dessert, good; very good for cooking.

VALUE: home market, first class; foreign market, second class.

SEASON: November to February.

BROCKVILLE (*Brockville Beauty*).

A seedling of Fameuse, which is as yet grown only to a limited extent in the eastern part of the Province. This fruit is inclined to run small as the trees overload.

ORIGIN: near Brockville, Ontario.

TREE: hardy, moderately vigorous; bears heavily every alternate year.

FRUIT: form conical; size medium to small; skin white, almost covered with bright red.

FLESH: color white; texture crisp, tender, breaking; flavor brisk acid.

QUALITY: dessert and cooking good.

SEASON: late August to mid-September.

CABASHEA (*Twenty Ounce Pippin*).

Not worth planting in Ontario. Through confusing its name with that of Cayuga Red Streak, often called Twenty Ounce, this apple has been widely planted in our Province. The tree is unproductive and the fruit, although large and fine in appearance, drops early and is poor in quality.

ORIGIN: unknown.

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TREE: vigorous, spreading, unproductive.

FRUIT: large, roundish oblate, slightly conical; skin yellowish green, shaded dull red on the sunny side; stem five-eighths of an inch long, stout, in a wide cavity of moderate depth; calyx open in a wide shallow basin; core medium.

FLESH: white, firm, coarse, subacid, only fair for cooking, useless for dessert.

VALUE: tested twenty years at Maplehurst, Grimsby, and found unprofitable on account of unproductiveness.

SEASON: October to December.

CANADA RED.

ORIGIN: unknown; Beach says it was brought from the neighborhood of Toronto, into Western New York State.

TREE: a strong grower, productive in some places, while a shy bearer in others, and hence is not recommended.

FRUIT: medium to large; irregular oblate; skin yellow, well splashed and washed with deep, rather dull red; dots fairly numerous, large, yellow, prominent; cavity deep, narrow; stem short, slender; basin narrow, shallow, slightly wrinkled; calyx small, closed.

FLESH: yellowish, tender, moderately juicy, mildly subacid with a pleasant but not high flavor; core of medium size.

QUALITY: good.

SEASON: mid to late winter.

COLVERT.

A fairly good fall market apple, being large in size and rather attractive in appearance but of fair quality only. It has been widely planted in Ontario for market. For kitchen use it is much inferior to the Gravenstein.

ORIGIN: uncertain.

TREE: vigorous and very productive.

FRUIT: large, form oblate, slightly conical; skin greenish yellow, with cheek and faint stripes of dull red; stem stout, half an inch in length.

FLESH: color yellowish white; texture tender, moderately juicy; flavor subacid, ordinary.

QUALITY: dessert fair, cooking good.

VALUE: second class for market.

SEASON: October to December.

ADAPTATION: succeeds at Georgian Bay and Bay of Quinte stations, and is widely grown in the older apple sections of Ontario.

CAYUGA (*Cayuga Red Streak*).

A large, fine-looking cooking apple for late autumn; a good market sort; grown in limited quantities in Ontario.

ORIGIN: Connecticut.

TREE: vigorous; compact; productive; an annual bearer; on large trees, growth is straggling.

FRUIT: very large, roundish, uneven; skin greenish yellow to yellowish white, with marblings and stripes of red and crimson, and a few large grey dots; stem three-quarters of an inch long, in a deep, slightly russeted cavity; calyx small, half open in a shallow, broadly furrowed basin.

FLESH: yellowish white, texture coarse grained, tender, moderately juicy; flavor brisk, subacid, pleasant.

QUALITY: dessert fair, cooking good.

VALUE: market first class.

SEASON: late autumn to early winter.

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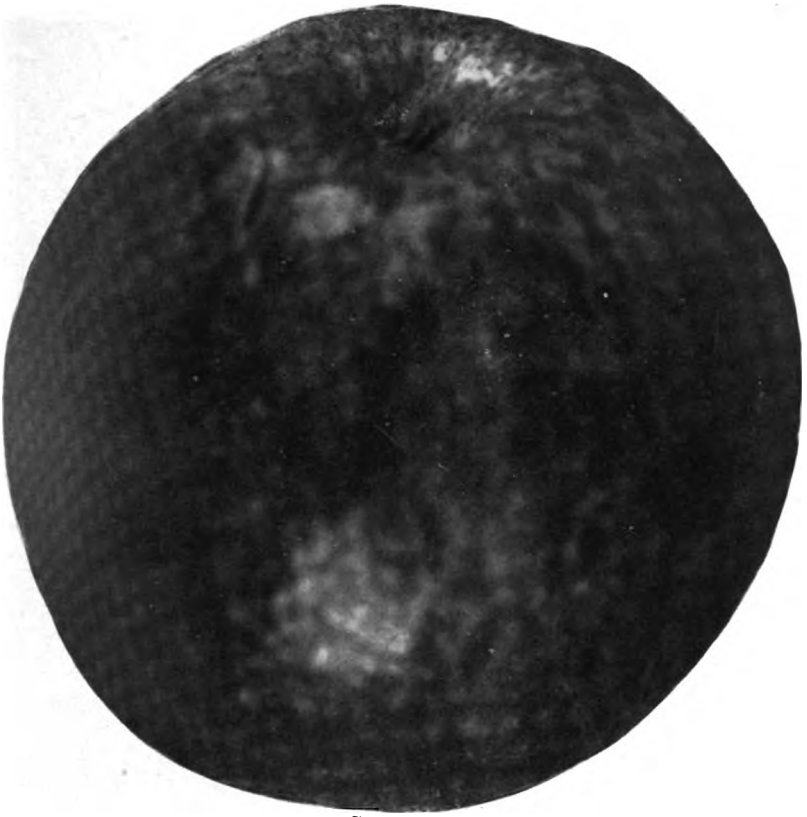
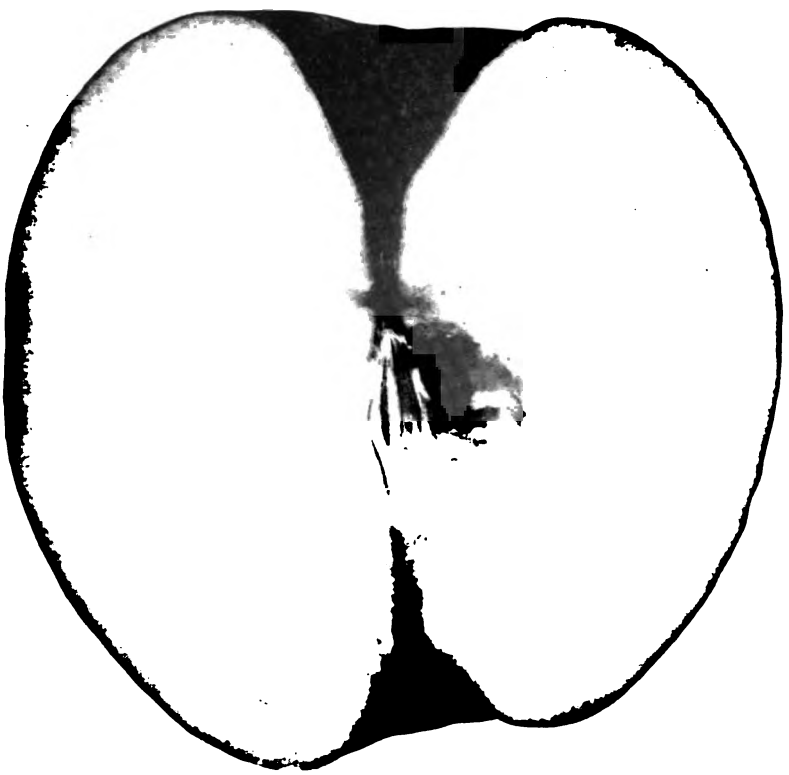


CAYUGA.



SECTION OF CAYUGA.

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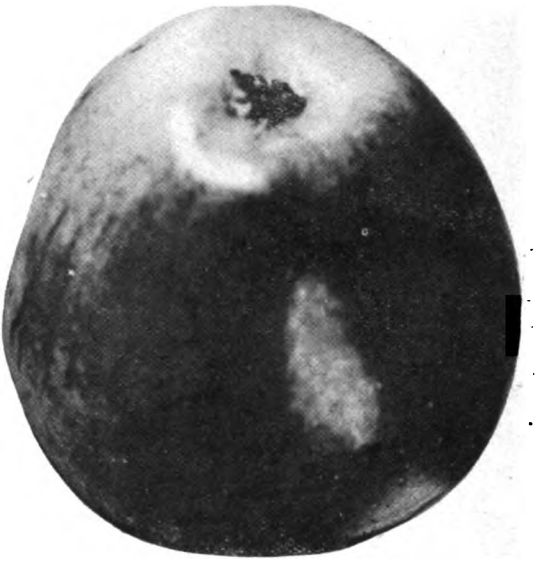
CHENANGO (*Strawberry*).

ORIGIN: Lebanon, Madison County, N.Y.

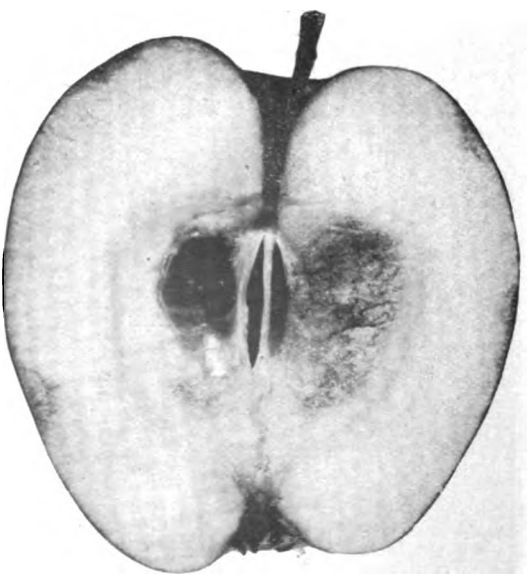
TREE: medium size, vigorous, with short, stout curved branches; fruit medium to large, elongated ovate, slightly ribbed, stem short to medium, calyx partly opened or closed, skin tough, smooth, yellowish-white, often almost entirely overspread and mottled with pinkish red conspicuously striped and splashed with bright carmine, flesh white, firm, tender, juicy, mild subacid, good to very good.

SEASON: latter part of August and through September.

Not planted very much in Ontario.



CHENANGO.



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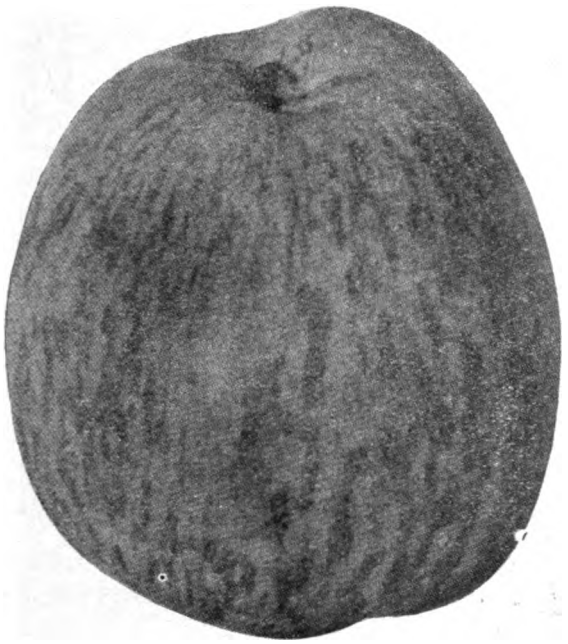
CHARLAMOFF (*Pointed Pipka, Arabka*).



CHARLAMOFF (*after S. B. Green*).

One of the best hardy varieties of its season which has been successfully grown at the Algoma station. It is classed by the Minnesota State Horticultural Society as one of four varieties having the first degree of hardiness.

ORIGIN: Russia; imported by Budd.

TREE: very hardy; habit spreading; growth vigorous; very productive.

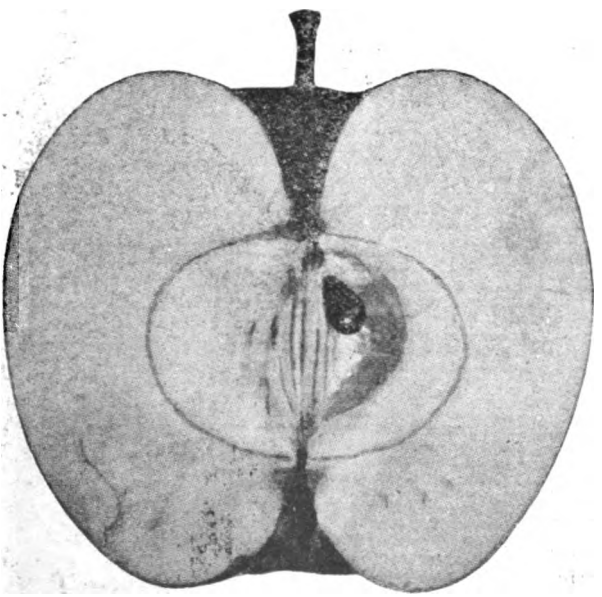
FRUIT: size about medium; form oblong, truncated, angular, ribbed; skin light yellow, covered with dark crimson stripes and splashes, with red cheek and white, minute dots; stem medium stout, in a deep, acute, russeted cavity; calyx open, sometimes closed, in a wide, shallow, wrinkled basin.

FLESH: color white, stained with red under the skin; texture somewhat coarse, juicy; flavor subacid, pleasant.

QUALITY: dessert good.

VALUE: market second class, being very perishable.

SEASON: August, just before Duchess.



SECTION OF CHARLAMOFF.

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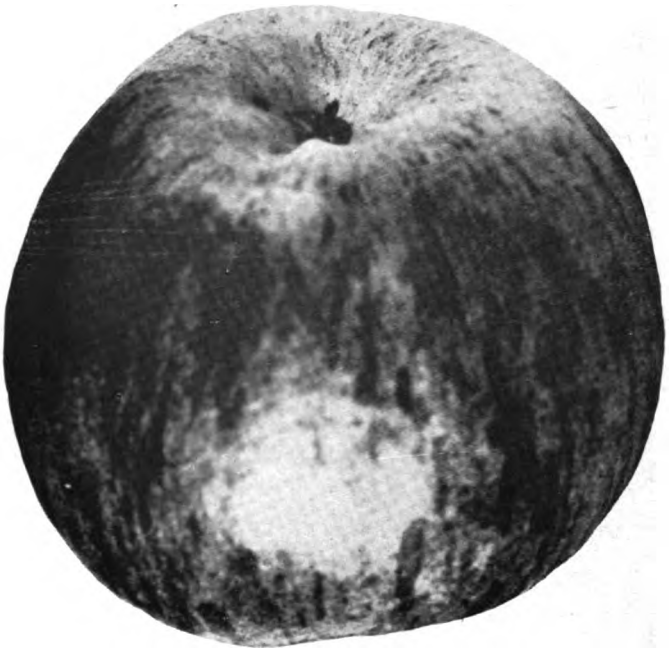
CRANBERRY PIPPIN.



CRANBERRY PIPPIN.

An apple worthy of being planted in southern Ontario as a fancy variety for export; although the quality is ordinary and not suitable for dessert its extreme beauty when opened in mid-winter, its large and even size, and the productiveness of the tree every alternate year, make it a desirable variety.

Sometimes, however, this variety is subject to warts and knots which mar its beauty.

ORIGIN: accidental, on a farm, near Hudson, N.Y.

TREE: very vigorous, healthy, spreading, and productive.

FRUIT: medium to large, roundish, oblate; skin smooth, yellow shaded and striped with two shades of red; stem slender, short, in a deep cavity; calyx closed, in a wide russeted basin.

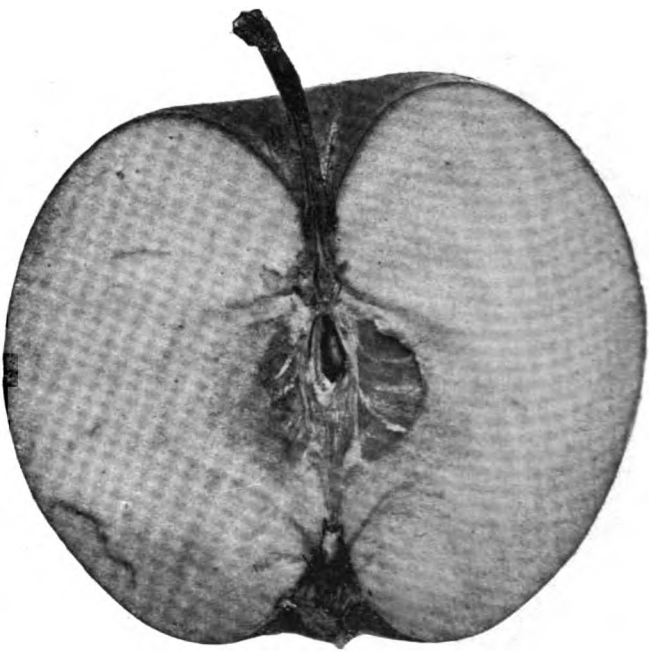
FLESH: color white; texture firm, crisp, coarse, moderately juicy; flavor subacid.

QUALITY: dessert poor; cooking fair.

VALUE: market second class.

SEASON: November to February.

ADAPTATION: southern portions of the Province, especially along the shores of the lakes.



SECTION OF CRANBERRY PIPPIN.

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DUCHESS.

(Oldenburg of Downing, Borovitsky of Royal Horticultural Society, 1824.)

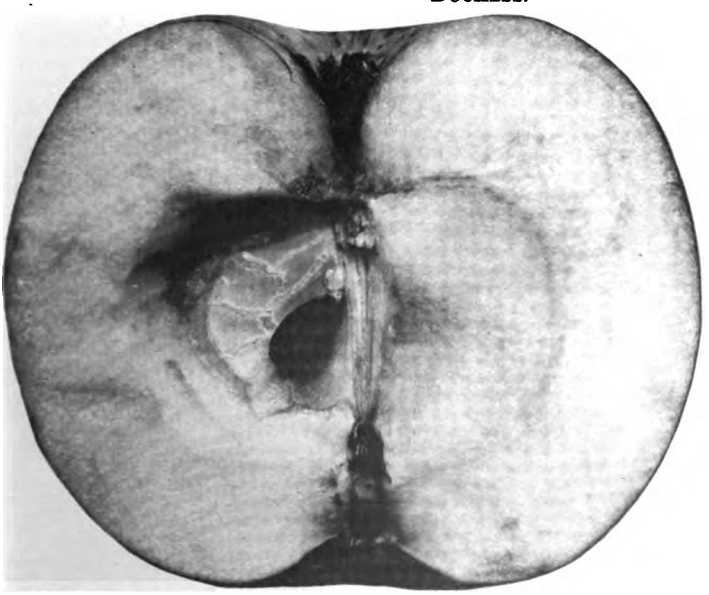
In cold storage, this apple may be profitably exported to Great Britain. It succeeds in every part of Ontario where the apple can be grown, and its beauty always brings for it the top price in the market.

ORIGIN: introduced to England from Russia about 1815.

TREE: very hardy, very vigorous and an early and abundant bearer.

FRUIT: medium to large; form regular, roundish oblate; skin greenish yellow, with bright red stripes, splashes and numerous russety dots; stalk slender, three-quarters of an inch long, set in a deep funnel-shaped cavity; calyx long, closed, in a deep broad basin.

DUCHESS.



SECTION OF DUCHESS.

FLESH: greenish, turning yellowish white at maturity; texture fine, firm and juicy; flavor brisk, refreshing acid.

QUALITY: dessert fair, cooking good.

VALUE: first class of its season for home market.

SEASON: August and September.

ADAPTATION: general. Succeeds well wherever apples are grown in the Province, and does exceptionally well on the borders of Lakes Ontario and Erie.

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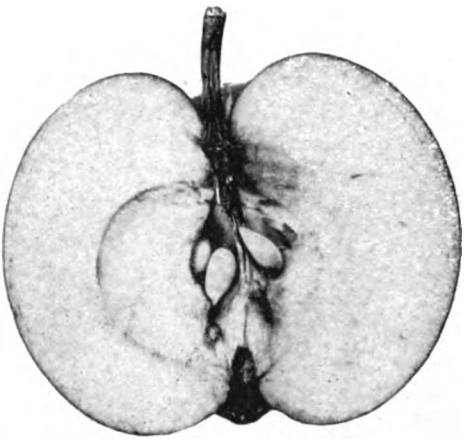
EARLY HARVEST.



The best apple of its season for dessert, but of late years rendered worthless in Ontario by scab, which not only spoils its appearance, but lessens its size and injures its flavor. The Early Harvest and Fall Pippin are the two apples which seem to be least able to resist this terrible fungus, and which most favor its spread. Unless, therefore, the fungus is checked by spraying, this apple must be left out of the list of desirable varieties.

ORIGIN: United States, in cultivation since about 1700 A.D.

TREE: only medium in vigor, never attaining a large size, old trees averaging from one-half to two-thirds the size of Greening trees of the same age; upright and spreading; productive, considering the size of the tree and the fruit.

FRUIT: medium round, oblate; skin smooth, bright straw color when ripe, with a few faint dots; stem short, one-half to three-quarters of an inch, in a medium cavity, often russeted; calyx closed in a shallow, slightly wrinkled basin.

FLESH: white, fine grained, juicy, crisp, tender; flavor rich, sprightly, pleasant subacid.

SEASON: late July to early August.

QUALITY: dessert good; cooking good.

VALUE: home market first class.

ADAPTATION: Succeeds in the best apple districts, but is much subject to scab.

FILLBASKET (*Kentish*).

An old English variety of great beauty of appearance and enormous size, often exceeding four inches in diameter. It is not, however, much grown in the commercial orchards of Ontario, being a fall apple, ill adapted to export, unless by cold storage, and of very ordinary quality.

ORIGIN: England.

TREE: vigorous, fairly productive, semi-hardy.

FRUIT: very large, oblate or roundish, slightly ribbed; color smooth, shiny, light green or pale yellow, sometimes almost white, and on sunny side splashed and striped with bright red; stem stout, short, set in a large cavity; calyx closed, set in a large often wrinkled basin.

FLESH: fine grained, tender and juicy; flavor mild, subacid.

QUALITY: poor for dessert, good for cooking.

VALUE: home market second class; foreign market third class.

SEASON: October to December.

ADAPTATION: North shore Lakes Ontario and Erie, east shore Lake Huron.

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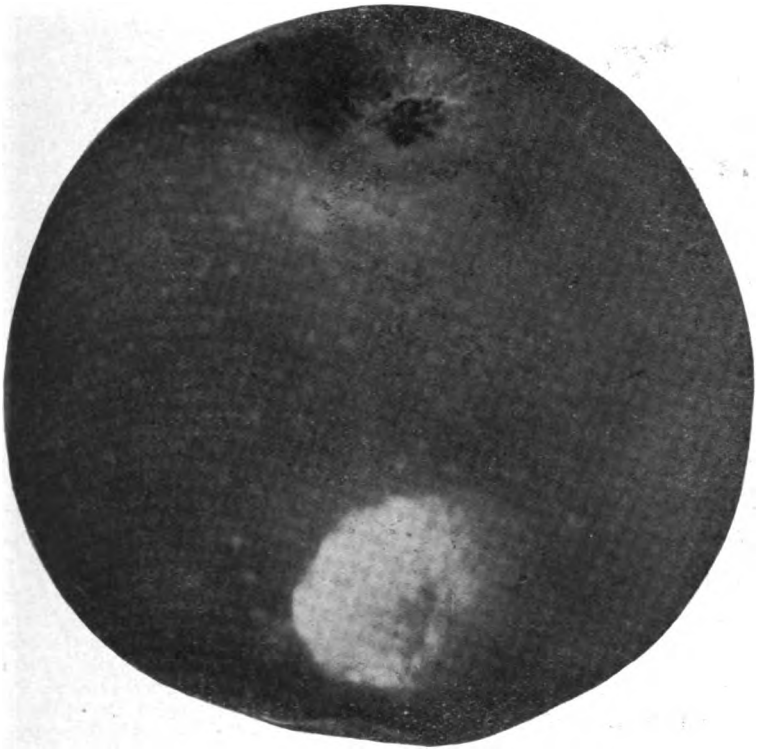
FALLAWATER.



FALLAWATER.

A large apple, of even size and fine appearance, which is grown for market quite extensively in Pennsylvania, Ohio, and in some of the Western States, and to some extent in Ontario. Were it more uniformly productive, we could recommend it as a profitable commercial variety.

ORIGIN: Pennsylvania.

TREE: a vigorous grower; fairly productive.

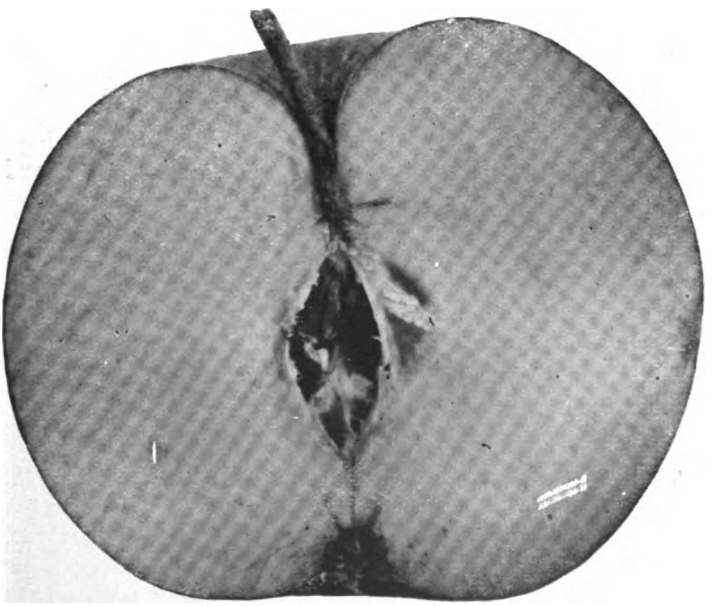
FRUIT: size large to very large; form round, regular, smooth; color pea green, shaded on sunny side with brownish red cheek, dots sparse, large light green; stem half an inch long, stout, set in a narrow, moderately deep cavity; calyx small, nearly closed, set in a shallow wrinkled basin.

FLESH: greenish white; texture fine-grained, firm, moderately juicy; flavor mild subacid, fair.

QUALITY: fair for cooking.

VALUE: home and foreign market only fair.

SEASON: December to March.



SECTION OF FALLAWATER.

ADAPTATION: successfully grown at the Bay of Quinte station and all parts of the Province farther south; also in the Lake Huron district, but in some localities it is said to be short-lived.

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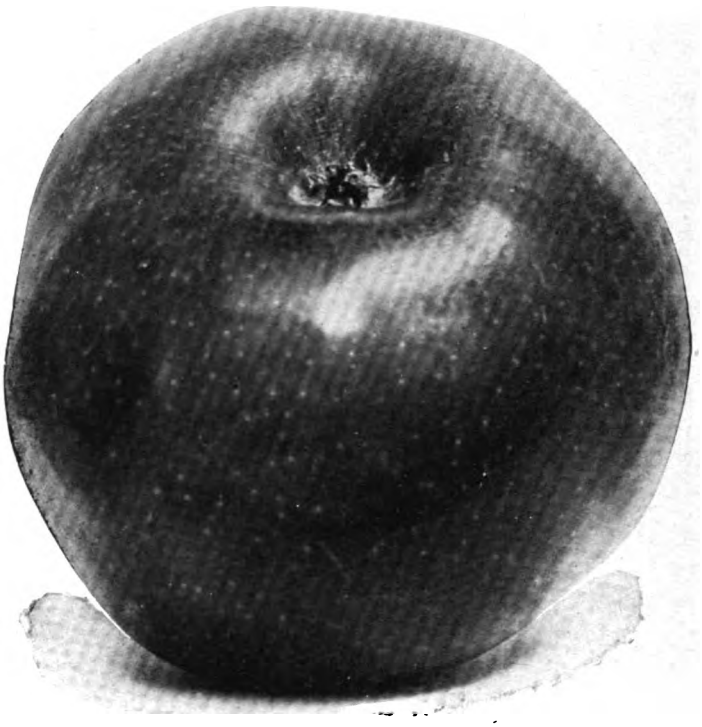
FALL PIPPIN.



FALL PIPPIN.

A general favorite as a fall cooking apple and possessing a fairly good flavor as a dessert apple. It was at one time planted very freely, but of late years it has been discarded because of its liability to the apple scab.

ORIGIN: America, probably from seed of Holland Pippin.

TREE: habit stout, vigorous, spreading; head round; long lived, some trees in Niagara district are now over 100 years of age; fairly productive.

FRUIT: large; form roundish, sometimes obscurely ribbed; skin yellow, often with red cheek and a few small grey dots; stalk half to three quarters of an inch long, set in a small, moderately deep russeted cavity; calyx small, open in a small, moderately deep basin.

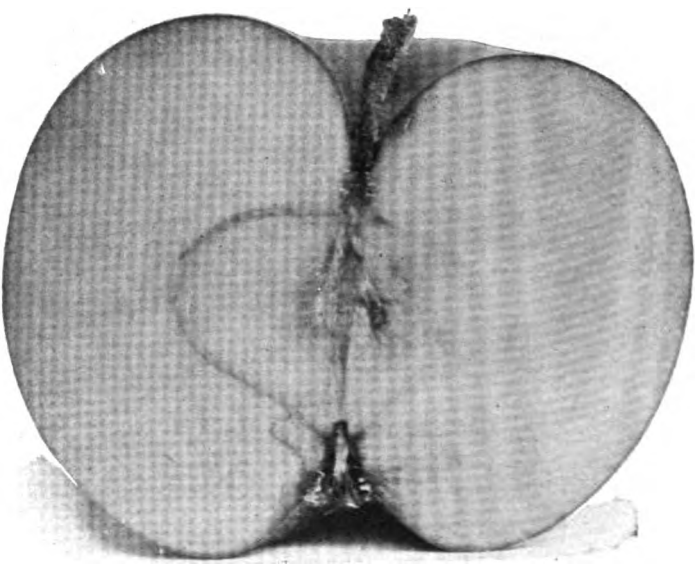
FLESH: greenish white; texture tender, mellow, and fairly juicy; flavor brisk, pleasant, aromatic.

QUALITY: dessert fair; cooking good.

VALUE: home market first class, foreign market second class.

SEASON: October to December.

ADAPTATION: hardy in the best apple districts, but very subject to scab.



SECTION OF FALL PIPPIN.

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FAMEUSE (*Snow, Pomme de Neige*).

The most highly valued of all table apples, and but for one fault the Fameuse would be the most profitable of all, especially in Eastern Ontario, where it attains its highest perfection. The fault is that it is quite subject to the apple scab, so that in some places the fruit is entirely worthless. The scab, however, may be quite readily controlled by proper preventive measures.

FAMEUSE.

ORIGIN: Province of Quebec, probably from seeds brought from France; it is often called Snow, from the color of its flesh.

TREE: moderately vigorous; moderately productive; hardy.

FRUIT: medium size, roundish; skin, light green, striped and shaded with two shades of red, often nearly covered with deep red; stem slender, half an inch long, in a small deep cavity; calyx small, segments often recurved, set in a shallow, slightly furrowed or wrinkled basin.

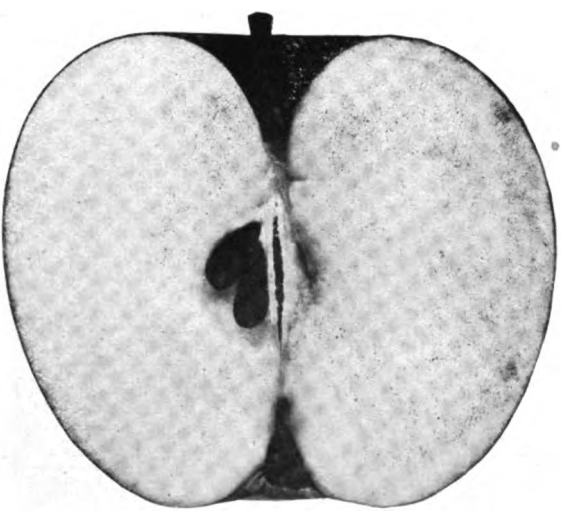
FLESH: snow white; texture tender, very fine grained, breaking, juicy; flavor, aromatic.

QUALITY: dessert first class; cooking fair.

VALUE: first class for all markets, when perfect in form and free from spots.

SEASON: October to December.

ADAPTATION: general, but specially adapted to eastern portion of the Province.



SECTION OF FAMEUSE.

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FANNY

FANNY.

ORIGINATED near Strasburg, Lancaster Co., Pa., U.S.

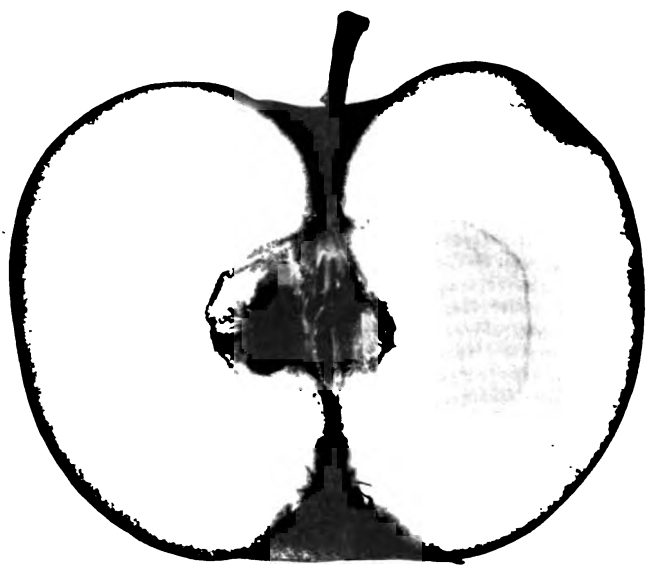
TREE: vigorous, spreading and productive.

FRUIT: above medium size, roundish to oblate, slightly conical; skin yellow, heavily splashed and washed with deep red; dots, few, yellow, and not prominent; cavity deep, moderately open; stem, short, slender; basin of medium depth, narrow, almost smooth; calyx partly open.

FLESH: white, crisp, tender, juicy, subacid; core small.

QUALITY: good.

SEASON: September (Macoun).



SECTION OF FANNY.

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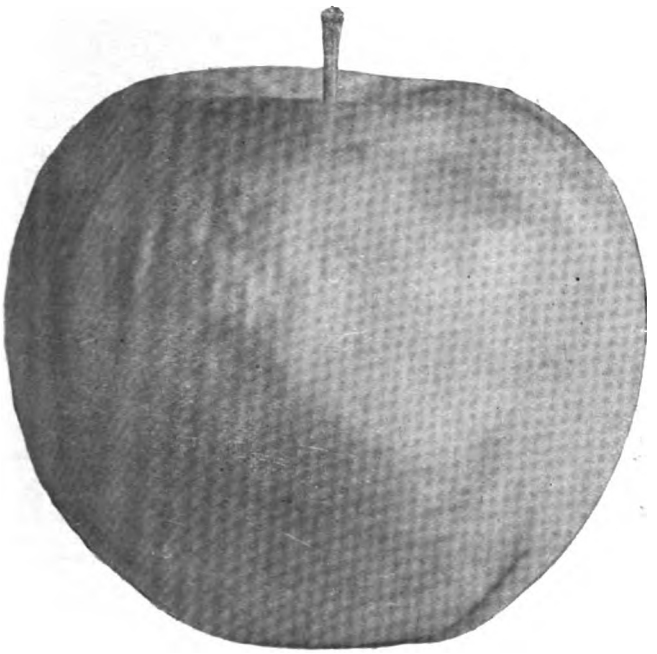
GIDEON.

A very pretty apple, but inclined to rot at the core: it is less highly colored than Duchess. These faults will prevent its being popular as an export apple.



GIDEON.

ORIGIN: by Peter M. Gideon, Excelsior, Minn., U.S. From crab seed probably crossed with Blue Pearmain.

TREE: vigorous, hardy, holds fruit well, productive.

FRUIT: large, round or slightly conical; skin white, with bright red cheek shaded with deeper red splashes; dots white, obscure; cavity broad, deep, regular or slightly corrugated; stem one inch long, slender; calyx half closed, in a small, corrugated basin.

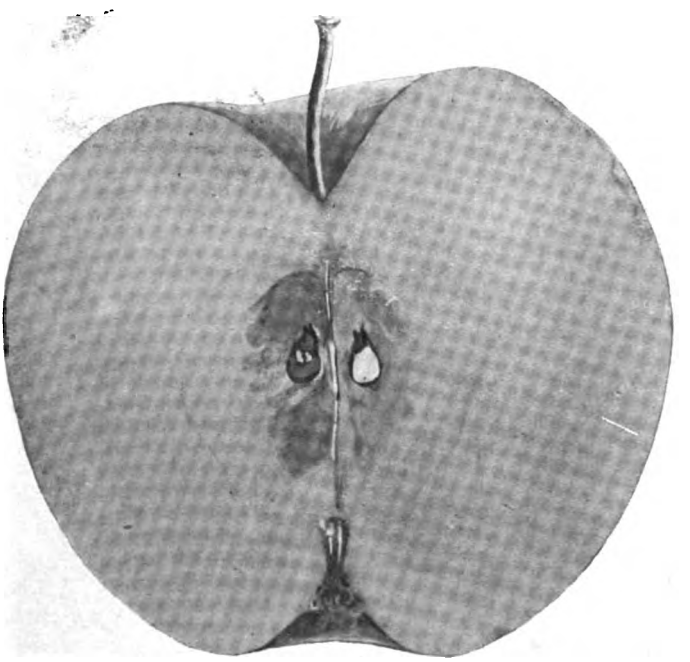
FLESH: white, flaky, crisp, juicy, subacid, fair to good.

QUALITY: dessert fair; cooking fair.

VALUE: home market second class; foreign third class.

SEASON: September to November; October at Ottawa.

ADAPTATION: only valuable in the north.



SECTION OF GIDEON.

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GOLDEN RUSSET.

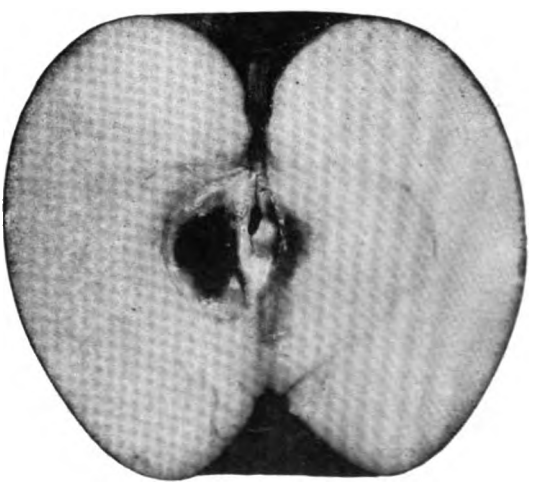
GOLDEN RUSSET.

This is the Golden Russet of Western New York. (It is sometimes incorrectly called American Golden Russet, which is a tender fleshed apple, only keeping until January). This apple is very valuable in the colder sections of the Ontario apple belt, the tree being comparatively hardy, and the fruit of high commercial value; in the warmer sections it is considerably grown in the older orchards, but not much planted of late years, because it is only of medium size, tedious to harvest, and inclined to drop early.

TREE: fairly vigorous, shoots slender, or willowy, speckled; habit irregular; fairly productive.

FRUIT: size medium; form roundish, slightly oblong, slightly flattened; skin covered with thick russet, occasionally showing a patch of greenish yellow; stem slender, half an inch to one inch long; not subject to scab.

FLESH: color yellowish, texture fine grained, firm, crisp; flavor aromatic, subacid.



SECTION OF GOLDEN RUSSET.

QUALITY: dessert good; cooking good.

VALUE: export first class.

SEASON: keeps till May in cold cellar, but is inclined to shrivel if the air is dry and warm.

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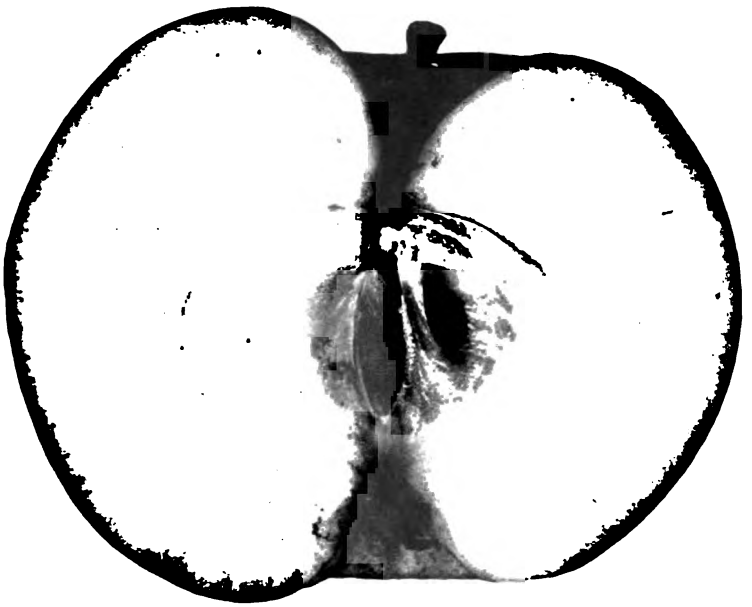
GRAVENSTEIN.



SECTION OF GRAVENSTEIN.

A favorite commercial apple in Nova Scotia, but altogether too little cultivated in Ontario, considering its many excellent characteristics.

ORIGIN: according to Hogg, the original tree grew in the garden of the Duke of Augustenberg, at the Castle of Graufenstein in Schleswig - Holstein in Germany, and was still standing about the year 1850. Leroy inclines to accept a statement by Hirschfelt, a German pomologist, who in 1788 wrote the first description of the apple, and stated that it was brought to Germany from Italy. The earliest trace of this apple we can find dates back to about 1760. It is now widely grown in Western Europe, and is a favorite everywhere.

TREE: very vigorous, hardy and productive.

FRUIT: large to very large; form oblate conical, somewhat one-sided and more or less pentagonal; skin greenish yellow to orange, beautifully striped and splashed with two shades of red; stem stout, about half an inch in length, set in a deep, narrow cavity; calyx partially closed, wide, long segments set in a wide, irregular slightly russet basin.

FLESH: yellowish white; texture, crisp and very juicy; flavor rich, vinous and aromatic.

QUALITY: dessert, very good; cooking, good.

VALUE: home market, first class; foreign market, first class.

SEASON: September and October.

GRAVENSTEIN.

ADAPTATION: general in the best apple sections.

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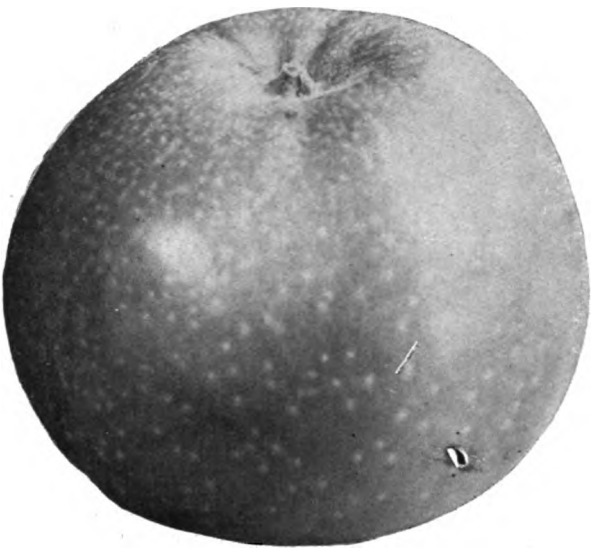
GREENING (*Rhode Island Greening*).

One of the staple varieties for profit in Ontario orchards. No one variety, except the Baldwin, was more widely planted in our Province previous to 1875, but since that time it has been liable to scab some seasons, especially in cases where proper spraying is neglected. Its color is against it in foreign markets, and yet, as it becomes known, the demand for it increases. It has a tendency to drop early, especially south of Lake Ontario, and, therefore, needs to be gathered in good season, about the first of October, as a rule. Remarkable instances of productiveness have been reported.



GREENING.

ORIGIN: Rhode Island.

TREE: very vigorous, spreading, a crooked grower; fairly hardy; very productive; succeeds well on a great variety of soils.

FRUIT: large, roundish, sometimes a little flattened, regular, unless overgrown; color green, becoming lighter as it ripens, often showing a blush when well exposed to the sun; dots light grey, aureole, numerous toward the apex; stem seven-eighths of an inch long in a smooth, narrow cavity; calyx partly closed in a nearly smooth shallow basin.

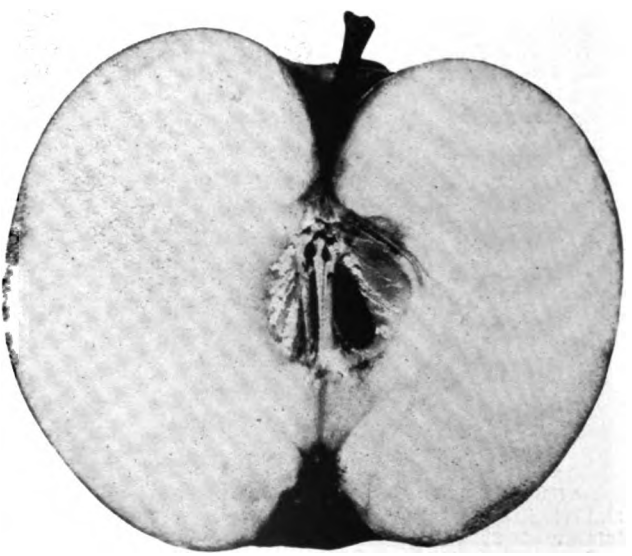
FLESH: white, with a greenish tint, yellowing as it matures; texture fine grained, crisp, juicy; flavor rich, slightly aromatic, pleasant, subacid.

QUALITY: dessert, medium; cooking, very good.

VALUE: home and foreign markets, first class.

SEASON: December to February.

ADAPTATION: succeeds in the best apple districts.



SECTION OF GREENING.

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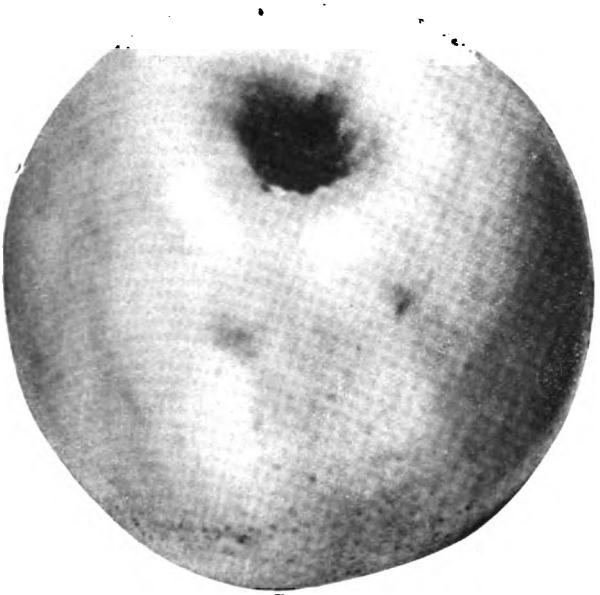
GRIMES (*Grimes Golden*).



GRIMES.

An apple that has a good reputation in some parts as a winter dessert apple, on account of its excellent quality and its rich golden color; not planted extensively in the commercial orchards of Ontario.

ORIGIN: Virginia; on the farm of Thomas Grimes.

TREE: moderately vigorous, branches with knobs at base; not hardy very far beyond north shore of Lake Ontario; usually a biennial or sometimes an annual bearer and a good cropper.

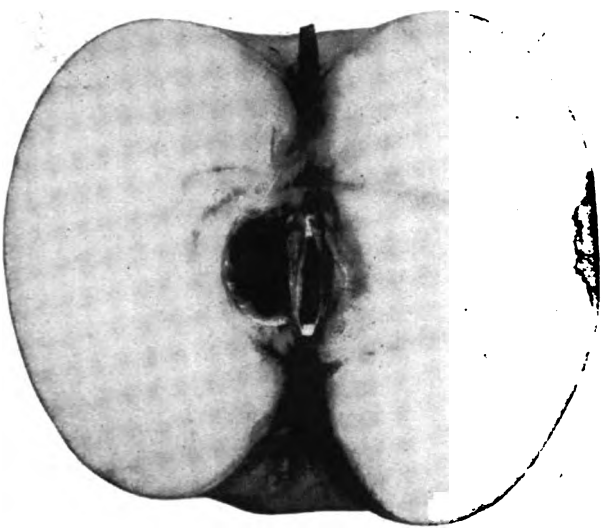
FRUIT: size medium; form roundish oblong; color rich golden yellow with russet dots; stem slender in a deep cavity; calyx partly closed in a deep, wrinkled, abrupt basin.

FLESH: yellow; texture firm, crisp, juicy; flavor rich, aromatic, spicy, subacid.

QUALITY: dessert best; cooking poor.

VALUE: market, second class.

SEASON: November to January.



SECTION OF GRIMES.

GRINDSTONE (*American Pippin*)

Valuable chiefly for its long keeping, and for cider.

ORIGIN: United States.

TREE: hardy, vigorous, productive

FRUIT: size medium; form regular, roundish oblate; skin dull green with patches and stripes of dull red and numerous dots; stem short, stout in a deep, slightly russeted cavity; calyx large, open, in a deep, medium sized, slightly wrinkled basin.

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FLESH: color yellowish white; texture firm, crisp, not very juicy; flavor brisk acid.
QUALITY: second rate for cooking; third rate for dessert.
VALUE: second class for market purposes.
SEASON: March to June.

HAAS (*Fall Queen*).

HAAS.

An old variety which was at one time popular in the colder parts of Ontario apple belt because of the hardiness of the tree, but which has now given place to the Wealthy.

ORIGIN: St. Louis, Missouri.

TREE: vigorous; habit upright, spreading; an early and an annual bearer, hardy.

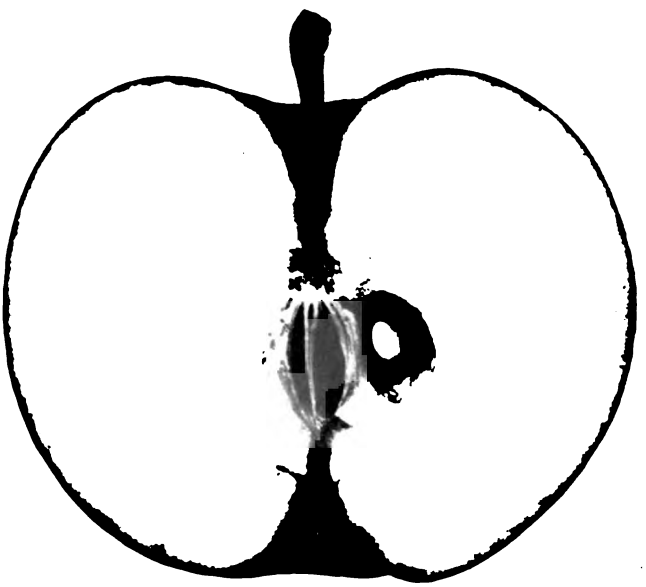
FRUIT: size medium; form oblate conical; skin thin, tough; color yellow, marbled, splashed and striped with crimson, with a few obscure white dots; stem short set in a broad cavity of moderate depth, slightly russeted; calyx half closed in an irregular, wrinkled basin.

FLESH: white, often stained with red next the skin; texture peculiar, quince like, juicy; flavor subacid, slightly astringent.

QUALITY: dessert poor; cooking fair.

VALUE: market second or third class.

SEASON: late autumn.



SECTION OF HAAS.

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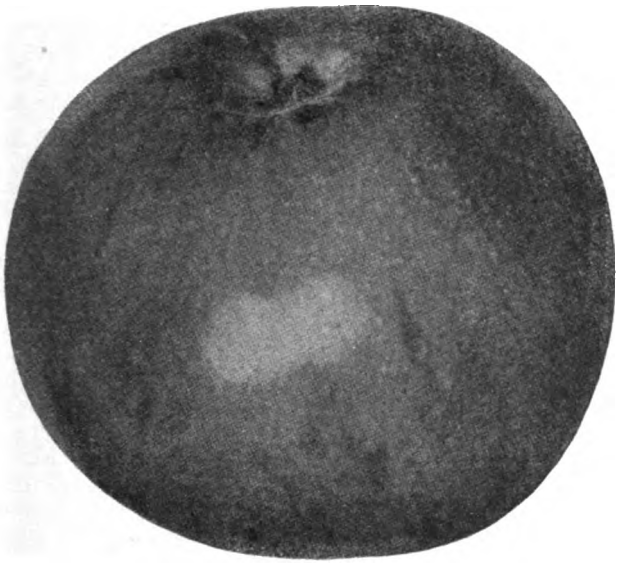
HIBERNAL.



HIBERNAL (after S. B. Green).

An attractive looking cooking apple, valuable also for hardiness of tree; one of the best of the Russian apples for our colder districts.

ORIGIN: Russia.

TREE: vigorous, of strong spreading habit; healthy; very productive.

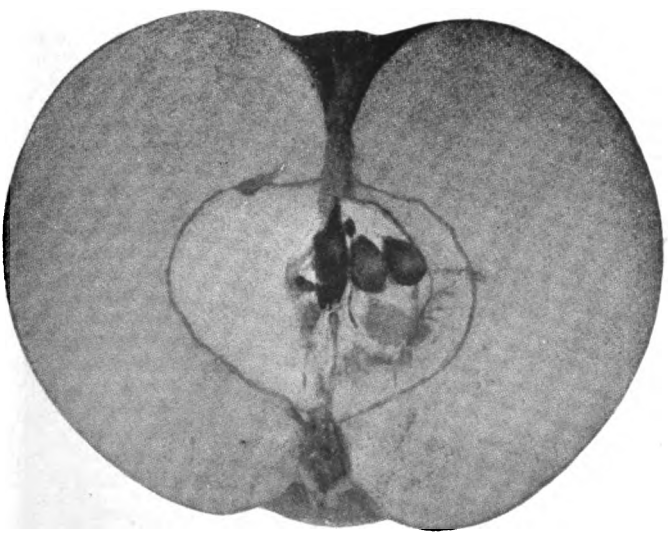
FRUIT: size large; form roundish oblate conical; skin yellowish, striped and splashed with red, with small white dots; stem medium length set in a moderately deep regular cavity with large patch of russet; calyx half open in a narrow shallow wrinkled cavity.

FLESH: color yellowish; texture, tender, crisp, juicy; flavor acid.

QUALITY: dessert poor; cooking good.

VALUE: home market in the north, first class.

SEASON: September to November.



SECTION OF HIBERNAL.

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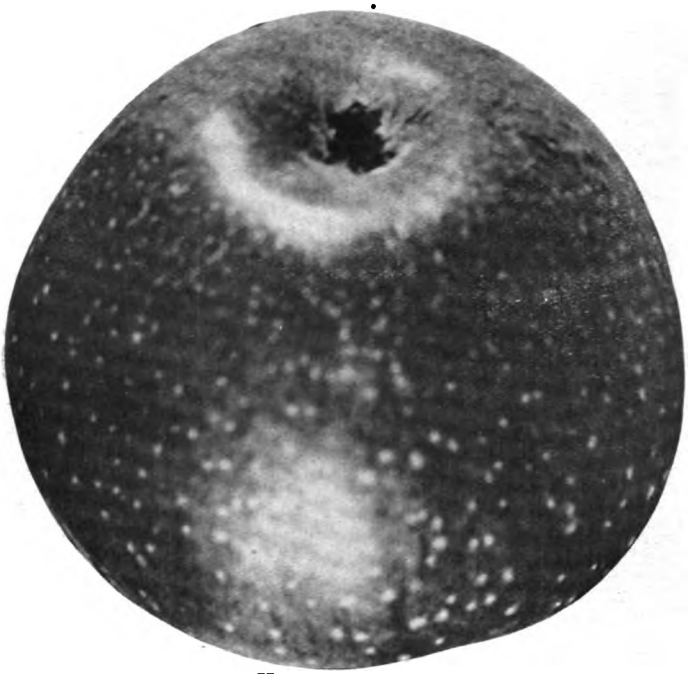
HUBBARDSTON (*Hubbardston's Nonsuch*).



HUBBARDSTON.

A first-class commercial apple for early winter. It succeeds well in the Province of Ontario, and deserves to be planted much more freely.

ORIGIN: Hubbardston, Mass.

TREE: hardy, vigorous, but somewhat subject to apple canker and therefore better top worked on some healthy grower; very productive; an early bearer.

FRUIT: size, medium to large; form round ovate, fairly regular; skin, rich yellow ground nearly covered with stripes and splashes of light rich red; stem three-quarters of an inch long, set in a narrow deep russeted cavity; calyx open in ribbed basin.

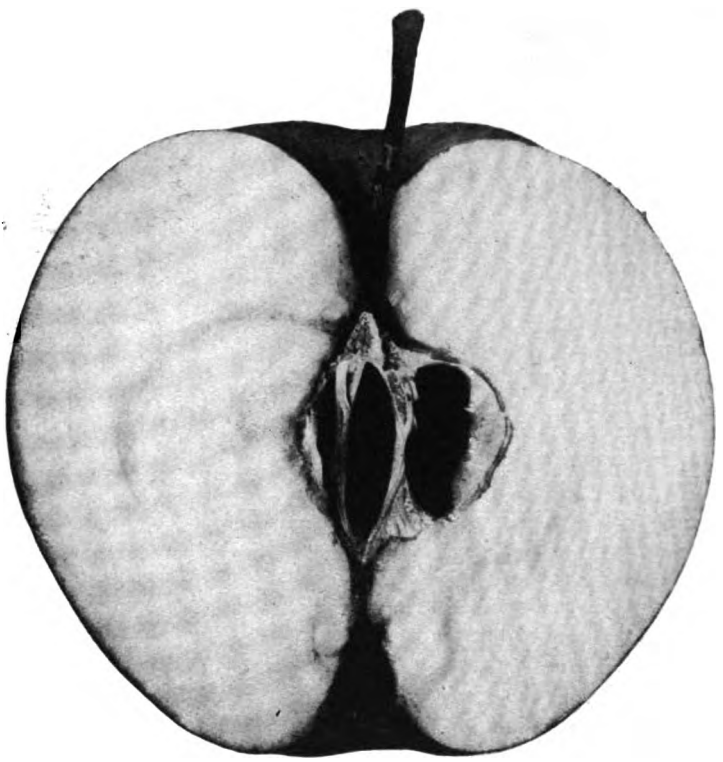
FLESH: texture tender and juicy; flavor subacid, rich, sweet and excellent.

QUALITY: very good.

VALUE: market first class.

SEASON: October to February.

ADAPTATION: succeeds in all the best apple districts.



SECTION OF HUBBARDSTON.

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HYSLOP.

A well known and widely cultivated variety of hybrid crab. Its dark, rich, red color and its late season make it a valuable variety.

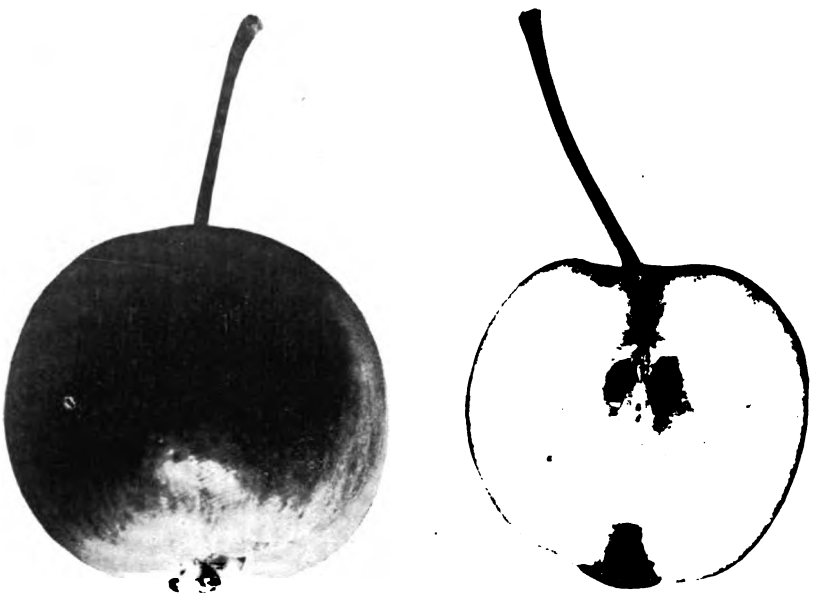
TREE: vigorous, of spreading habit.

FRUIT: size medium; form roundish ovate, obscurely angular; color a dark rich red, covered with heavy blue bloom, and having many obscure yellowish dots; stem about one inch and an eighth in length, set in an obtuse, regular cavity.

FLESH: yellowish, acid.

VALUE: very good for culinary uses.

SEASON: September and October.



HYSLOP.

JONATHAN.

A first class winter dessert apple, of the Spitzenburg type, valuable for the home garden, but too small to be planted for market; succeeds well in some locations.

ORIGIN: Woodstock, New York State.

TREE: of moderate vigor; shoots slender, drooping; should be top worked on a vigorous trunk; inclined to be self sterile, and needs to be planted with other varieties for proper pollination.

FRUIT: size medium, in some localities small; form longish, truncated conical, regular; skin colored dark brilliant red in sun, and striped, splashed with lighter red, with numerous small whitish dots; stem long, slender, set in a deep acute cavity; calyx small, closed, in a wide, deep, abrupt basin.

FLESH: color white; texture tender and juicy; flavor subacid, spicy, aromatic, excellent.

QUALITY: dessert very good; cooking good.

VALUE: special markets first class; export second class.

SEASON: November to February.

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KING (*King of Tompkins' County*).

Said to have originated in New Jersey. On account of its excellent quality for cooking, its peculiarly rich aromatic flavor, its beautiful appearance and large size, this apple is taking the highest place in the great apple markets of the world. Unfortunately the tree is a shy bearer, and consequently unprofitable as an orchard variety, unless under exceptional circumstances. Top-grafted on Tolman Sweet, it is said to be more productive. For home use it is excelled by no apple.

KING.

TREE: a vigorous grower, of spreading habit, but not long-lived.

FRUIT: large, roundish, uneven; skin yellowish, shading off from red to dark crimson; stem short and stout, inserted in a wide, deep, somewhat irregular cavity; calyx closed in a broad, shallow, slightly corrugated basin.

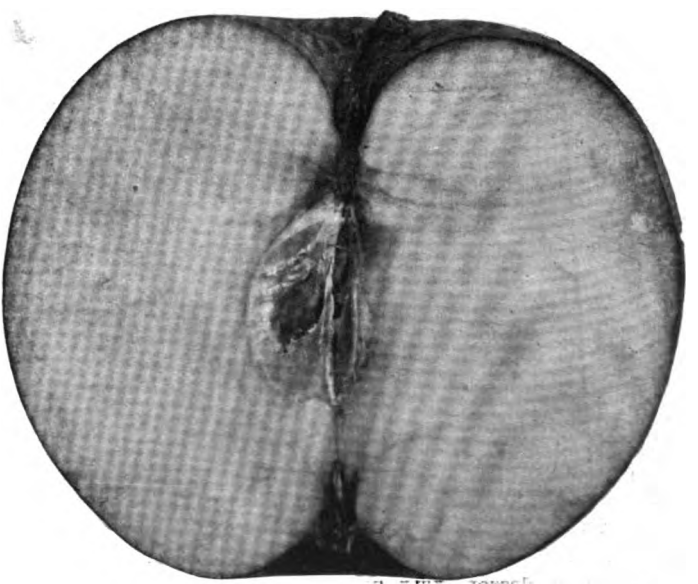
FLESH: yellowish white, crisp and juicy, moderately firm; flavor rich, agreeable, aromatic.

QUALITY: dessert and cooking, very good.

VALUE: home market first class; export first class.

SEASON: October to February in Southern Ontario.

ADAPTATION: not hardy at Simcoe station unless top grafted on Tolman Sweet, or some other hardy stock, and, therefore, it is not recommended for general planting in northern sections.



SECTION OF KING.

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LADY.

A beautiful little apple for the amateur's collection, and very highly valued where known for a dessert apple, having a pleasant flavor and great beauty. In Europe the apple is known as Api, but in America it has become known as the Lady apple.

ORIGIN: France.

TREE: upright habit and bears fruit in clusters, vigorous, only fairly hardy and productive.

FRUIT: very small, flat oblate. Color green, turning to yellow, half covered with a rich red cheek, and many tiny dots which are more numerous towards the apex. Stem slender, half an inch long, set in a deep regular cavity. Calyx closed in a small wrinkled basin.

FLESH: greenish white; texture fine grained, crisp and juicy; flavor pleasant.

QUALITY: dessert, very good; cooking too small to be of any value.

SEASON: December to May.

ADAPTATION: successfully grown as far north as the Bay of Quinte station.

LA VICTOIRE.

This variety has not, so far, proved very productive, but is a handsome apple, and on account of its season and hardiness will probably prove useful in the north.

ORIGIN: near Grenville, Que. Probably a seedling of Fameuse.

TREE: hardy and a strong moderately spreading grower.

FRUIT: above medium size, oblate, regular; skin greenish yellow, almost covered with crimson; dots fairly numerous, gray, distinct; cavity of medium depth and width, slightly russeted; stem short and stout; basin of medium depth and width, almost smooth; calyx open and medium in size.

FLESH: white, tinged with red, rather coarse, moderately juicy, mildly subacid, with a pleasant flavor; core small.

QUALITY: good.

SEASON: Midwinter. (*Macoun.*)

LIVLAND RASPBERRY (*Lowland Raspberry*).

A handsome hardy summer apple of very good dessert quality, one of the best summer apples for home use, but drops rather badly and ripens unevenly.

ORIGIN: Russia.

TREE: moderately upright, vigorous, moderately productive.

FRUIT: medium to large, roundish to oblate, conic, angular, color pale yellow, more or less marked, splashed and washed with bright red with a few pale yellow indistinct dots; stem short to medium, moderately stout in a narrow cavity of medium depth; basin shallow, narrow, slightly wrinkled.

FLESH: white tinged with red, crisp, tender, juicy, subacid with a good flavor.

QUALITY: dessert very good.

SEASON: middle to last of August.

ADAPTATION: quite hardy, having been fruited in Southern Manitoba. (*Macoun.*)

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LOUISE (*Princess Louise, Woolverton*)

An apple of great value for the home garden as a choice dessert variety, but probably not sufficiently productive to be profitable in the commercial orchard.

ORIGIN: at Maplehurst, near Grimsby; a chance seedling of the Snow and first known as Woolverton. Samples were first exhibited by Mr. L. Woolverton at a meeting of the Ontario Fruit Growers' Association at Hamilton, where it was given the name Princess Louise, after Her Royal Highness, wife of the then Governor-General, His Excellency the Marquis of Lorne.

TREE: of slender habit; fairly vigorous; hardy; moderately productive.

FRUIT: roundish, size medium; skin greenish yellow, of bright waxy lustre, with cheek of clear bright carmine; stem stout, three-quarters of an inch long, in a narrow, moderately deep cavity; calyx half open, in a broad, shallow, slightly plaited basin.

FLESH: pure white; texture tender, fine, somewhat crisp, juicy with rich aromatic flavor.

QUALITY: dessert very good; cooking fair.

VALUE: home market, first class.

SEASON: November to February.

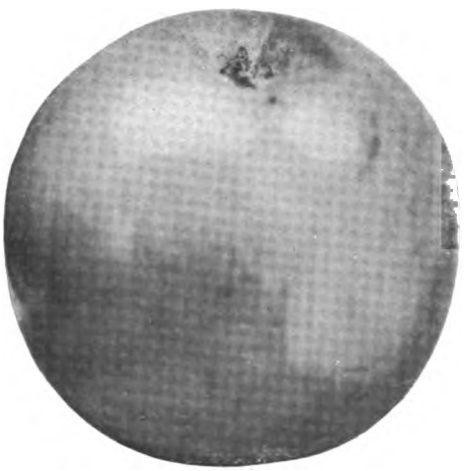
LONGFIELD.

A late fall variety, valued chiefly for its hardiness; too small to be profitable where better kinds will succeed.

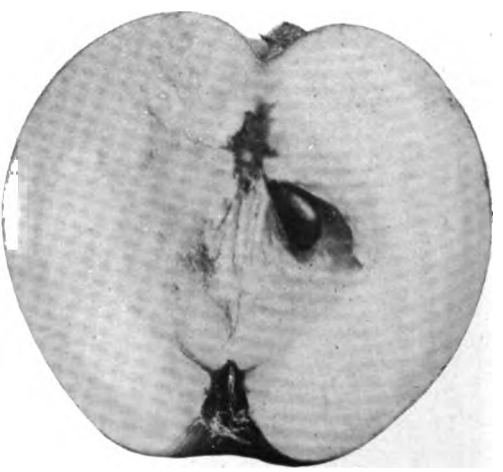
ORIGIN: Russia.

TREE: a poor straggling grower; very hardy; very productive, inclined to overbear and requires thinning; an early bearer.

FRUIT: size small; form roundish conical; skin yellow, with bright red cheek, and a few large yellowish dots; smooth; tender, showing bruises quickly; stem short, set in a deep regular usually slightly russeted cavity; calyx half open in an abrupt, wrinkled basin.



LONGFIELD.



SECTION OF LONGFIELD.

FLESH: white; texture very tender, juicy; flavor pleasant, subacid.

QUALITY: dessert fair; cooking good.

VALUE: market third class.

SEASON: October and November.

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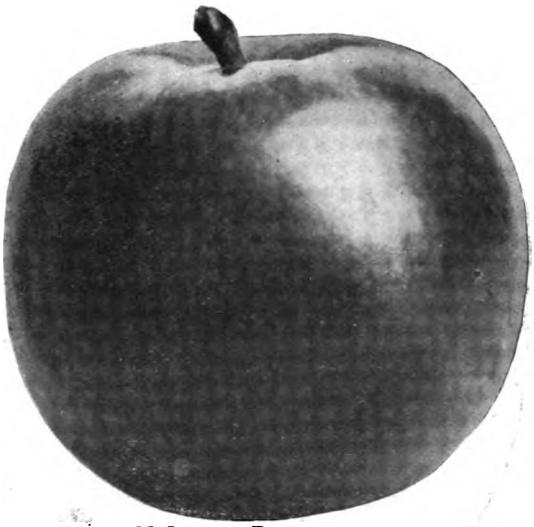
McINTOSH (*McIntosh Red*).

A very fine dessert apple for early winter use. At Ottawa and along the St. Lawrence and other places where conditions are favorable, it is counted one of the best dessert apples of its season, adapted and profitable for export.

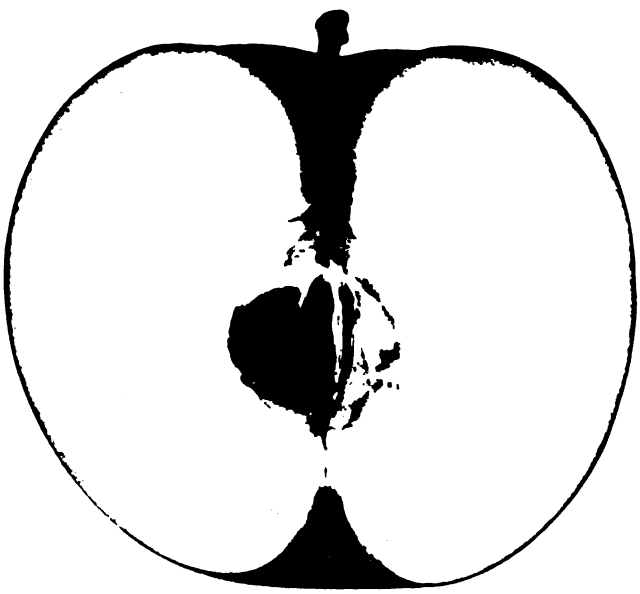
ORIGIN: with John McIntosh, Dundela, Ont., on whose farm the original tree was alive until quite recently. In 1912 a monument was erected at Dundela in honor of this tree.

TREE: hardy, vigorous; fairly upright; fairly productive; an annual bearer; of Fameuse type.



McINTOSH RED.

FRUIT: size medium to large; form roundish; color, deep crimson in sun, light crimson on shady side, inclined to show broken stripes and yellow dots, often with a heavy blue bloom; stem one inch in length, stout, set in a wide, and often somewhat irregular cavity, which is green at bottom; calyx closed in a smooth, regular, rather shallow basin.



SECTION OF McINTOSH RED.

FLESH: snow white; texture crisp, tender, very juicy; flavor slightly subacid, aromatic, perfumed near the skin.

QUALITY: dessert first class.

VALUE: home market first class.

SEASON: November to January; quite ready for eating by November first.

ADAPTATION: general; attains to best development in the northern apple growing sections, such as the St. Lawrence.

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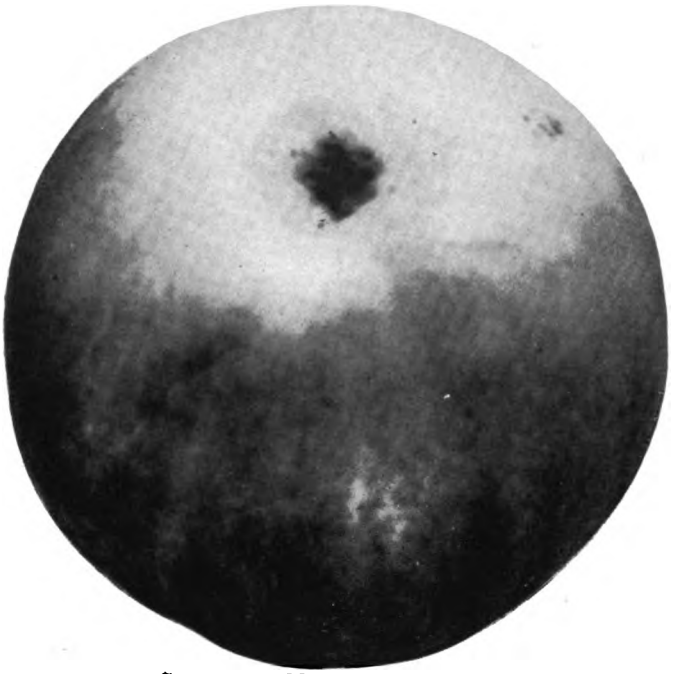
MAIDEN BLUSH.



SECTION OF MAIDEN'S BLUSH.

A valuable apple for the amateur because of its extreme beauty, but not considered a very profitable market variety by Ontario fruit growers.

ORIGIN: New Jersey.

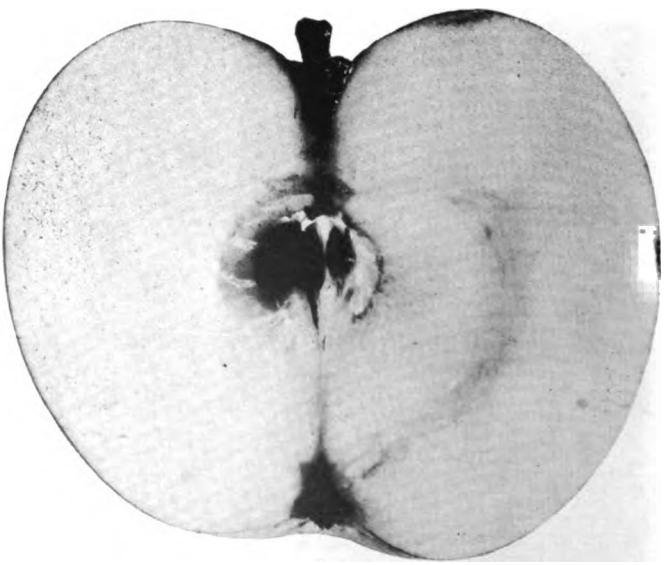
TREE: moderately vigorous grower, and productive.

FRUIT: size medium to large; form oblate, very regular, but slightly one-sided; color lemon yellow with beautiful crimson blush; stem three-quarters of an inch long, set in a moderately deep, wide cavity; calyx closed, in a shallow, slightly wrinkled basin.

FLESH: color white; texture fine, tender; flavor pleasant; sub-acid.

QUALITY: dessert, fair; cooking, good.

SEASON: September to November.



MAIDEN'S BLUSH.

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McMAHON (*McMahon White*).

A good sized and rather attractive fall apple, valuable especially for the hardiness of the tree; succeeds well at the Central Experimental Farm, Ottawa; too tender in flesh to ship well.

ORIGIN: from seed of Alexander, planted about 1860 by A. L. Hatch, Ithaca, Wisconsin.

TREE: very hardy; very strong grower; productive.

FRUIT: size large, uniform; form roundish oblate, slightly conical, obscurely ribbed; skin light yellow, becoming white at full maturity, often with blush of red and white dots; stem short, about half an inch long, stout, in an acute, deep, russeted cavity; calyx half open in a narrow, moderately deep, slightly wrinkled basin.

FLESH: color white; texture nearly fine, tender, juicy; flavor subacid.

QUALITY: dessert fair; cooking very good

VALUE: home market first class; export third class.

SEASON: October to January.

MARTHA.

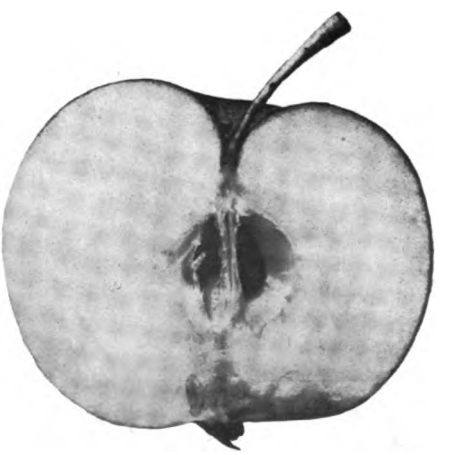
A hybrid crab.

ORIGIN: by Peter M. Gideon, Excelsior, Minnesota.

TREE: medium size, moderately vigorous, spreading; very hardy; early bearing and a reliable cropper.

FRUIT: large, oblate, very regular; surface smooth, yellow, almost entirely covered with a beautiful bright red, with a bluish bloom, no stripes or splashes; dots white, conspicuous; cavity wide, regular; stem long; basin very wide, nearly flat; segments often nearly obsolete, core closed.

MARTHA.



SECTION OF MARTHA.

FLESH: yellowish white, acid.

QUALITY: one of the best of its class for culinary purposes.

SEASON: early to mid-September.

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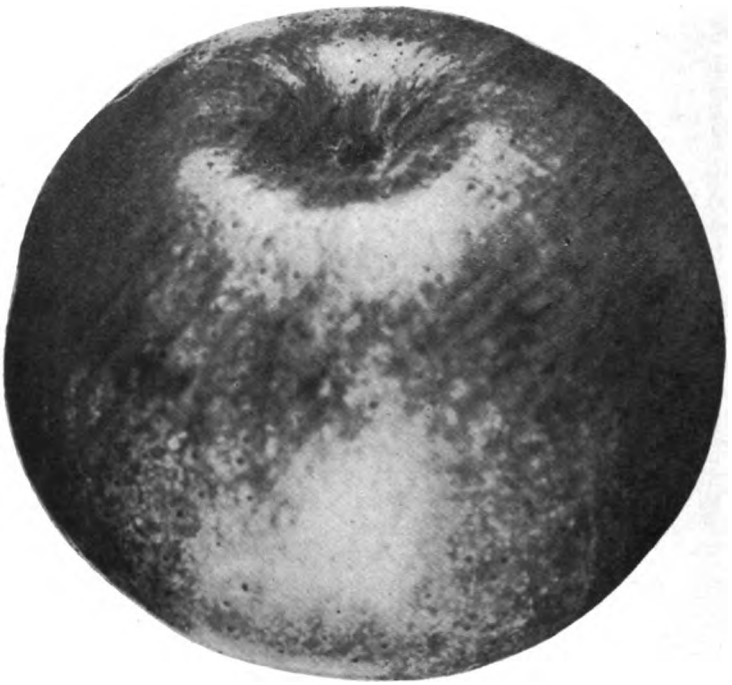
MANN.

The Mann apple is not very highly recommended for extended orchard planting in Ontario, because of its rather unattractive green color in shipping season. The tree has the merit of being a productive variety and an early bearer, but the fruit is inclined to drop early, and to be small when not thinned.



MANN.

ORIGIN: New York State, a chance seedling introduced by Dr. Mann, after whom it was named by the Western New York Horticultural Society.

TREE: hardy, moderately vigorous, spreading, with slender branches; a little slow coming into bearing and inclined to overbear.

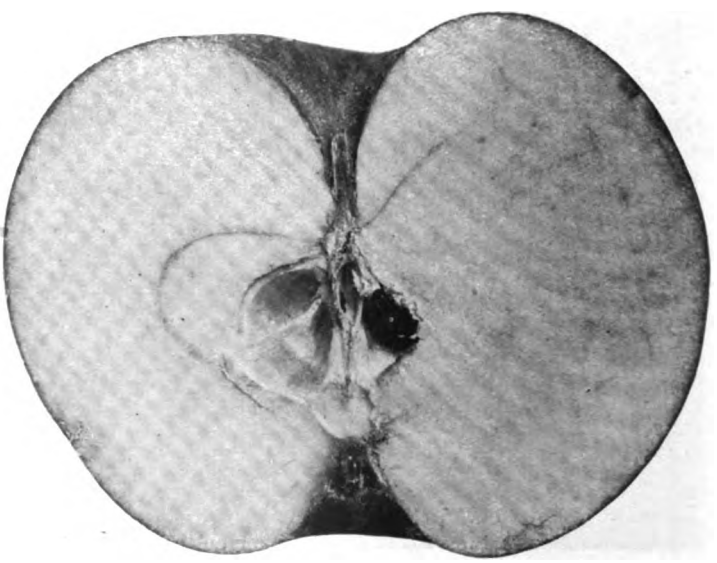
FRUIT: of large size when thinned and well cultivated, form roundish, oblate, regular; skin dull green, yellowing at maturity, nearly covered with light green dots; stalk half an inch long in a large, slightly russeted cavity; calyx closed in a somewhat abrupt, furrowed and wrinkled basin.

FLESH: yellowish, moderately firm, juicy, agreeable, subacid.

QUALITY: dessert poor; cooking good.

VALUE: first class for home or foreign market, but the best prices are not always obtained for the fruit, owing to its unattractive color.

SEASON: January to April.



SECTION OF MANN.

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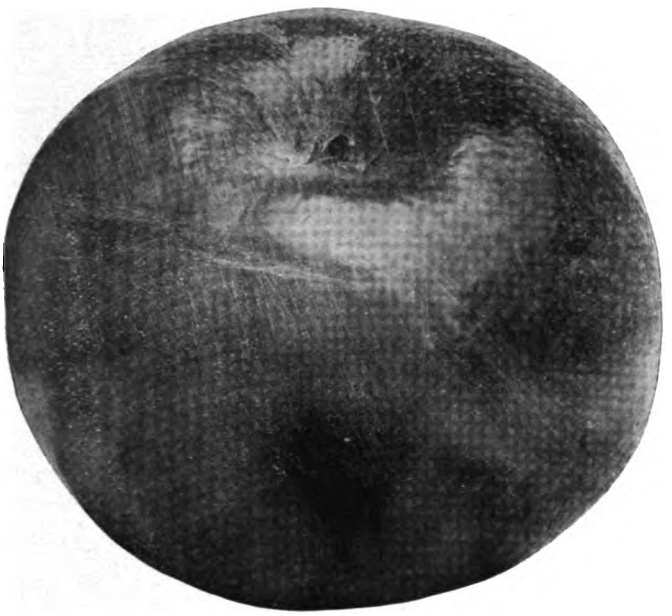
MILWAUKEE.

One of the best hardy winter apples for the commercial orchards in the northern belt of apple culture in Ontario; tested several years at the St. Lawrence station, and reported as one of the most promising winter apples for profit yet tested for that district; a fairly good shipper, but its lack of color is a serious fault as a market apple.

ORIGIN: a seedling of Duchess of Oldenburg, by Geo. Jeffrey, Milwaukee, Wisconsin.



MILWAUKEE.

TREE: growth moderately vigorous; habit spreading; very hardy; very productive; an early bearer; foliage dark green, abundant; shows characteristics of the Duchess.

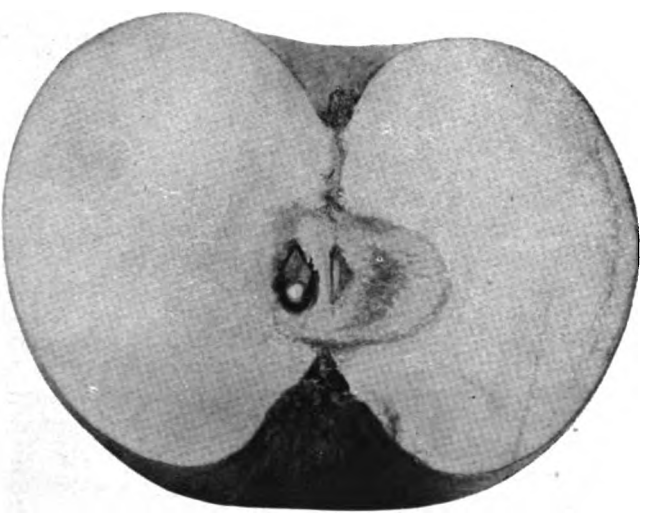
FRUIT: large, form oblate, flattened, slightly angular; skin yellowish green blushed and streaked with bright red and crimson on the sunny side; stem slender, one-half inch long in a large, deep, often russeted cavity; calyx half closed in a wide, deep wrinkled basin.

FLESH: color yellowish white; texture tender, crisp, juicy; flavor acid.

QUALITY: dessert fair; cooking very good.

VALUE: for near markets first class.

SEASON: December to March.



SECTION OF MILWAUKEE.

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NEWTOWN PIPPIN (*Yellow Newton Pippin, Albermarle*).

The highest priced apple that reaches the English market, but not much grown in Ontario.

ORIGIN: Newtown, Long Island.

TREE: a slow grower and only moderately hardy; needs rich soil and good cultivation.

FRUIT: medium to large; form, roundish oblate, with broad obscure ribs terminating in five crowns at the apex; color, dull green, becoming yellowish during the winter, with reddish-brown tinge on the sunny side, and dotted with small grey russety dots; stem three-quarters of an inch long, inserted all its length in a deep, wide, funnel-shaped cavity; calyx small, closed in a small, moderately deep furrowed basin.

FLESH: greenish white; texture firm, crisp, juicy; flavor, rich and highly aromatic.

VALUE: home markets, first class; foreign market, first class.

QUALITY: cooking, first class; dessert, first class.

SEASON: January to May, at its best in March.

ADAPTATION: only to certain favored sections.

NORTH STAR (*Dudley Winter*).

Originated in Maine. Fruit roundish; size above medium to large; cavity, open, deep, slightly russeted; stem medium length, slender; basin deep, medium width, slightly wrinkled; calyx partly open; color pale yellow, streaked and splashed with deep, lively red; dots few, small, pale yellow, indistinct; skin moderately thick, tender; flesh yellow, rather coarse, tender, moderately juicy; core small; subacid, pleasant flavor; quality above medium, almost good; season late September to early winter. Tree vigorous and productive. A handsome apple, about the same season as Wealthy. This variety is succeeding well in some of the colder parts of the country. (*Macoun.*)

NORTHWESTERN GREENING.

One of the winter commercial apples, adapted especially for colder sections; attractive in appearance. It is inferior in flavor and quality to the Rhode Island Greening.

ORIGIN: Wisconsin; introduced in 1872 by E. W. Daniels.

TREE: productive, but long in coming into bearing; hardy, in Minnesota reckoned to be of the second degree of hardiness, or in the same class as the Wealthy.

FRUIT: size large to very large; form roundish, slightly conical; color green, becoming yellowish, with small white dots; stem about half an inch long in a regular funnel-shaped cavity of moderate depth; calyx closed, in a regular, slightly wrinkled basin.

FLESH: color greenish white; texture fine grained, firm, juicy; flavor sprightly, subacid, pleasant.

QUALITY: dessert, good; cooking, good.

VALUE: home market, first class.

SEASON: winter.

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ONTARIO.

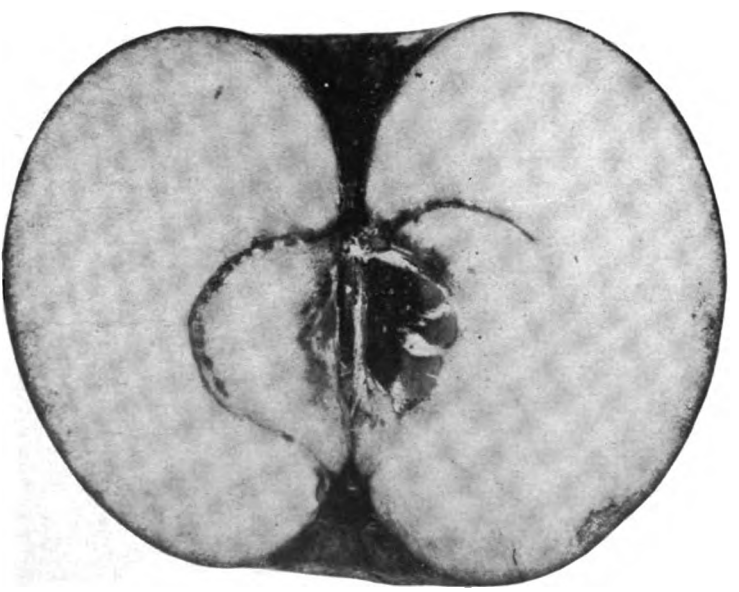
ONTARIO.

This is a native of Ontario, as its name indicates. It was originated by the late Charles Arnold, of Paris, Ontario, by crossing Wagener and Spy. Its early and abundant bearing, the good quality and even size of the fruit, are points in its favor as an export variety. It was tested in a commercial way for some years at the Bay of Quinte station, where it was counted profitable.

ORIGIN: Paris, Ontario.

TREE: fairly hardy, moderately vigorous, somewhat spreading; very productive; an early bearer and short lived.

FRUIT: large, oblate, slightly ribbed; sides unequal; skin yellowish, nearly covered with bright red, with a few scattered small white dots with bluish bloom; stem seven-eighths of an inch long, in a deep, russeted uneven cavity; calyx closed in a moderately deep, corrugated basin.



SECTION OF ONTARIO.

FLESH: white with green tint, yellowing slightly as it ripens; texture fine grained, tender, juicy; flavor mild, subacid, sprightly, aromatic.

QUALITY: very good for all purposes.

SEASON: November to April.

ADAPTATION: Southern Ontario to north shore of Lake Ontario and other good apple districts.

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ORANGE.

A fairly good dessert variety of hybrid crab.

ORIGIN: United States.

TREE: a slow grower; productive.

FRUIT: size medium; form round, slightly flattened at the ends; color light orange, with minute white dots and russet veins; stem slender, one and a quarter inches in length, set in a deep, open cavity; calyx closed, in a furrowed basin.

FLESH: color yellowish, yellow veinings; texture a little dry; flavor mild, pleasant, acid.

SEASON: September to November.

PATTEN (*Patten Greening*).

ORIGIN: Iowa.

TREE: hardy; moderately vigorous; very productive.

FRUIT: large oblate; cavity deep, medium width, russeted; stem short; basin deep, medium width; calyx open, large; skin pale yellow with traces of pale green, with a pink blush; dots moderately numerous, pale green, distinct; bloom, slight; skin, moderately thick.

FLESH: yellow, moderately juicy, tender, coarse; core, small; subacid; pleasant flavor.

QUALITY: above medium.

SEASON: October to mid-November. Hardier than Wealthy and useful where that variety will not succeed. (*Macoun.*)

PHOENIX.

A fairly profitable commercial apple in some parts. It is grown in Northumberland County and in other apple sections in the Province, and by some growers is ranked equal to the Baldwin for profit.

ORIGIN: Illinois.

TREE: healthy and productive.

FRUIT: medium to large; roundish, sometimes quite one-sided; color greenish yellow ground well covered with deep red, obscurely striped with a darker shade, and having a few small grey dots; russeted about the cavity and green about the basin; stem one half an inch long in a funnel-shaped cavity; calyx half closed.

FLESH: creamy white, coarse grained, somewhat juicy; flavor mild, acid, pleasant.

QUALITY: dessert, poor; cooking, good.

VALUE: first class for export, if shipped early.

SEASON: December to February.

PORTER.

"Fruit above medium, oblong ovate, conical, regular, often ribbed at apex; bright yellow, sometimes a dull blush in the sun; stalk one inch long, slender, cavity rather small; basin narrow; flesh tender, rich, rather acid, of fine flavor. Fair and productive. Early autumn. (*American Fruit Culturist.*)

It is desirable for planting for home use or for some local market, but generally it is not regarded as a profitable commercial variety.

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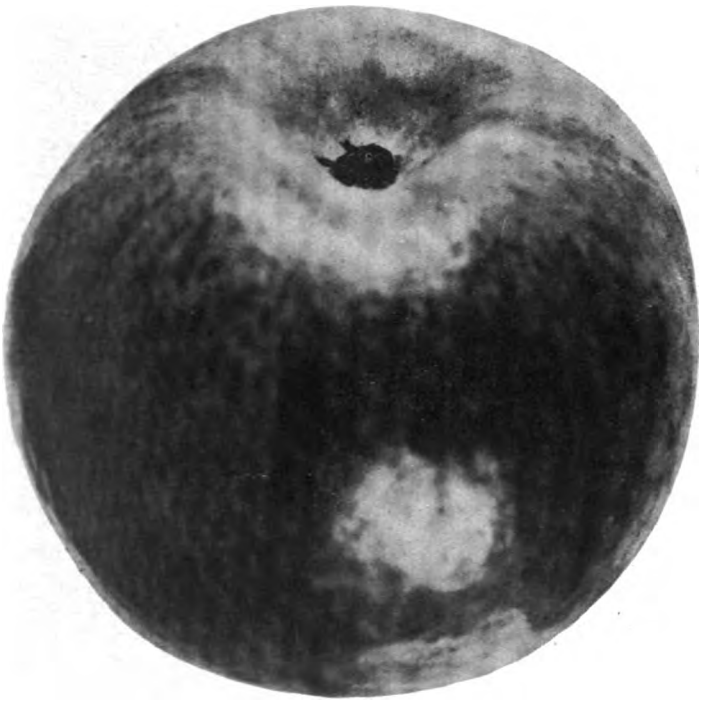
PEERLESS.



PEERLESS.

A remarkably attractive fall market or shipping apple; grows bright and clean, like Duchess, without blemishes; growing in favor. Caston grows this apple to perfection near Lake Simcoe, Ontario.

ORIGIN: seedling of Duchess; Minnesota, 1865.

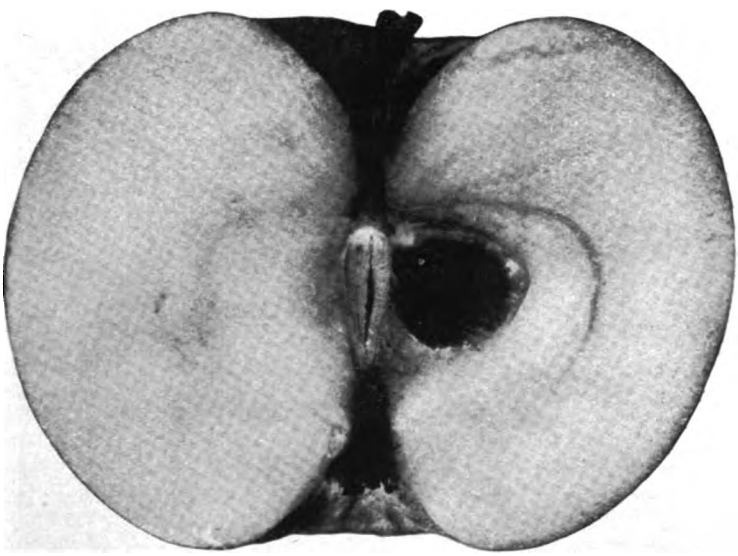
FRUIT described by Hanson as follows: large, roundish oblate, regular; surface greenish, striped and splashed rather thinly with dull red, slightly marbled on sunny side; cavity wide with radiating green (a characteristic); stem short; basin wide, usually abrupt and wavy; calyx closed or nalf open.

FLESH: firm, juicy, subacid, good.

QUALITY: cooking, first class.

COMMERCIAL VALUE: first class.

SEASON: September to November. (*Woolverton.*)



SECTION OF PEERLESS.

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PEWAUKEE.

A good commercial apple for the northern limits of the Ontario apple belt where Spy and Baldwin are tender; but not as hardy as was at first supposed. It is not gaining in popularity because the fruit is deficient in color and quality and drops badly.

PEWAUKEE.

ORIGIN: seed of Oldenburg crossed with Northern Spy, raised by G. P. Peffer, Pewaukee, Wisconsin.

TREE: hardy, but not equal in this respect to Wealthy; vigorous; habit: round topped with upright centre; an annual bearer.

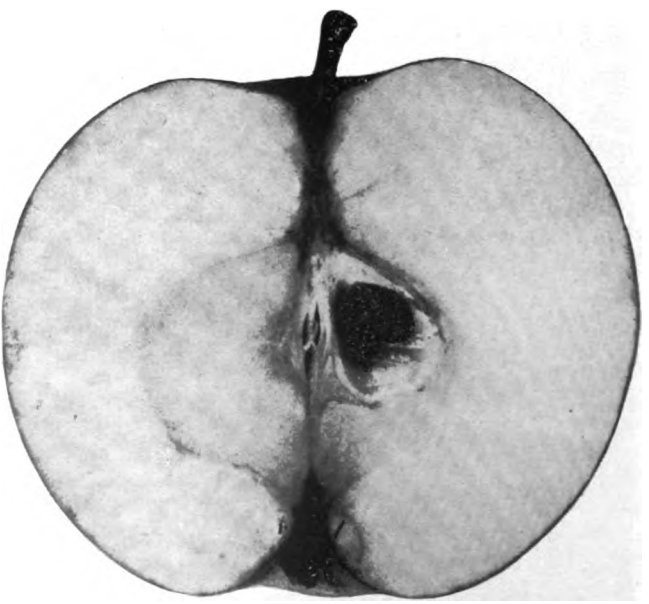
FRUIT: size large; form roundish oblate, irregular, unequal; color yellow striped and splashed with red; dots whitish; bloom grayish; stem short, half an inch, sometimes fleshy at point of insertion, set in small shallow often flat cavity, sometimes lipped; calyx half open, large, in a small shallow, corrugated basin.

FLESH: color yellowish white with yellow veinings; texture firm, rather coarse, juicy; flavor fair, subacid.

QUALITY: dessert fair; cooking good.

VALUE: home or foreign market first class.

SEASON: December to March.



SECTION OF PEWAUKEE

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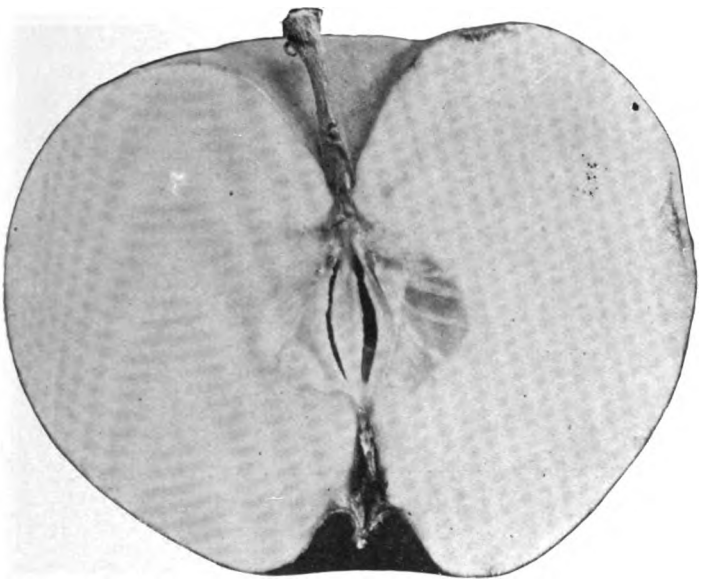
PRIMATE.



SECTION OF PRIMATE.

A fine dessert apple for the home garden; too tender for distant shipment.

ORIGIN: uncertain, probably Western New York.

TREE: hardy, vigorous, symmetrical, very productive.

FRUIT: medium to above medium; form oblate conical; skin light yellow, with crimson blush on sunny side; stem about one inch long inserted in a large deep furrowed cavity; calyx closed in an abrupt, moderately deep, somewhat corrugated basin.

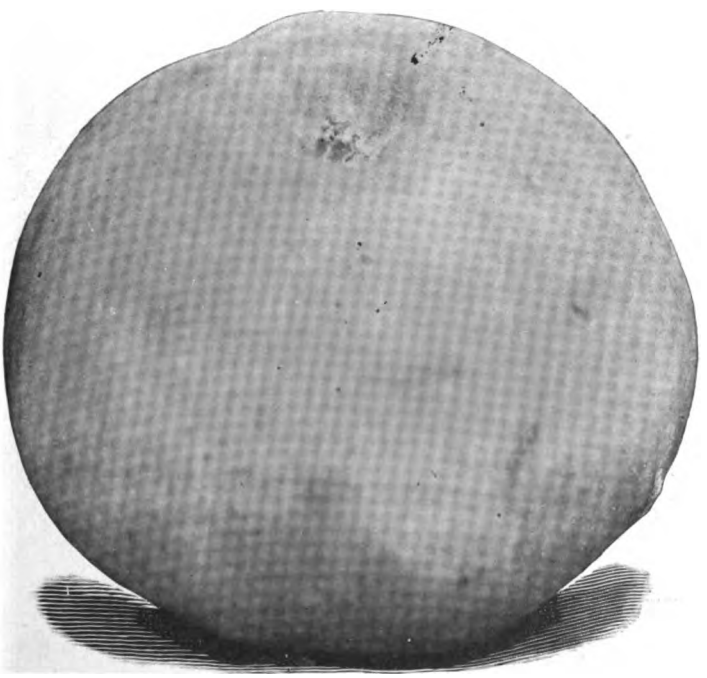
FLESH: color white; texture tender, juicy, with a very pleasant, subacid flavor.

QUALITY: dessert very good; cooking good.

VALUE: home market first class; foreign market second class.

SEASON: August and September.

ADAPTATION: succeeds in best apple districts.



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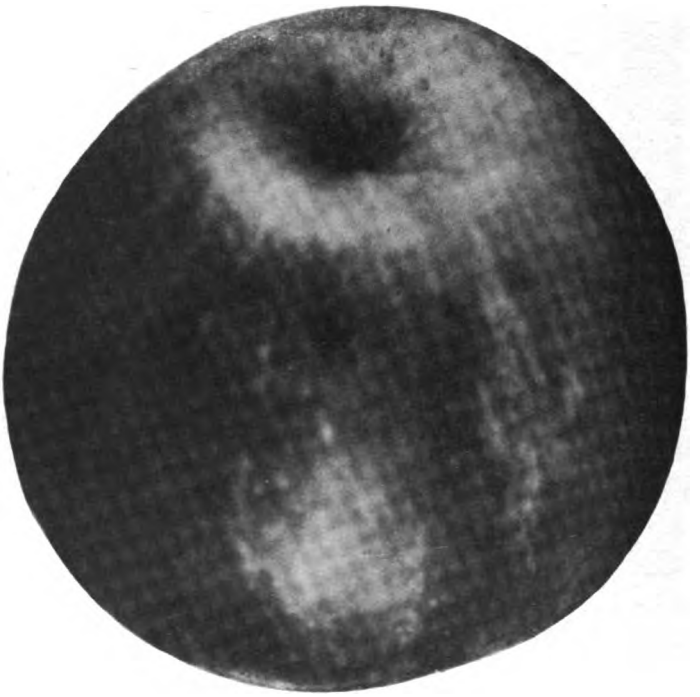
RIBSTON (*Ribston Pippin*).



RIBSTON.

A highly esteemed English apple, largely planted in Ontario previous to 1860, but of late not so popular in commercial orchards.

ORIGIN: Ribston Hall, near Knaresborough, England.

TREE: moderately vigorous; fairly healthy; not hardy at the north; productive; an early bearer.

FRUIT: size medium or above; form roundish, slightly conical; skin rough; color russety yellow with stripes of red and often a red shade on sunny side; stem short, set in a wide often somewhat russeted cavity; calyx small, closed in a narrow angular, ribbed basin.

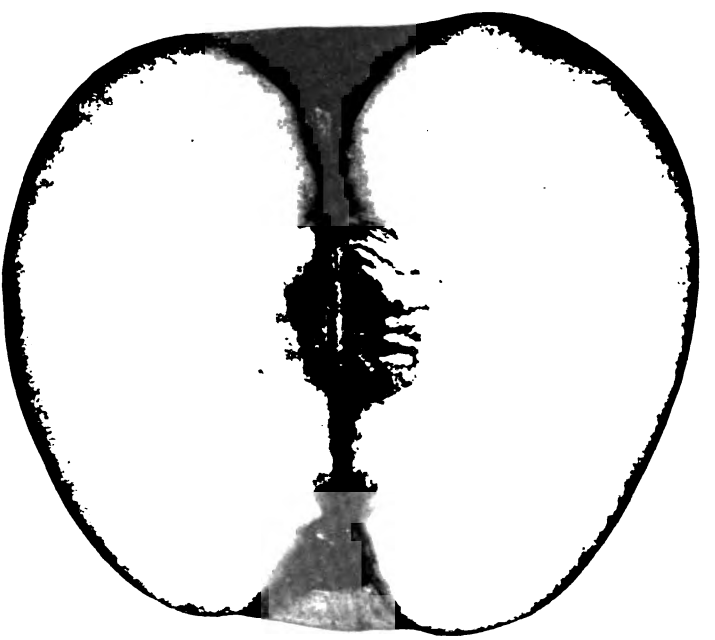
FLESH: yellow; texture crisp, firm, granular, juicy; flavor rich, aromatic, subacid.

QUALITY: dessert good; cooking very good.

VALUE: home market first class.

SEASON: November and December; keeps till January in a cool cellar.

ADAPTATION: succeeds in best apple districts, although it is somewhat hardier than Baldwin or Greening.



SECTION OF RIBSTON.

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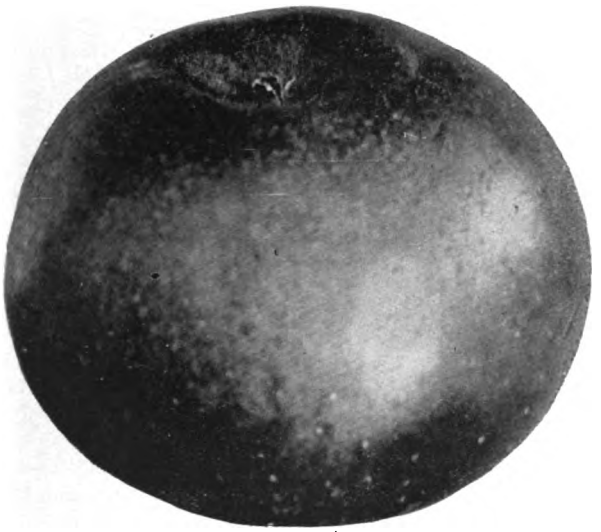
ROXBURY (*Roxbury Russet*).

One of the staple export varieties in many parts of Southern Ontario, because of its long keeping qualities. It resists scab well, but is inclined to drop early from the trees, resembling the Greening in this respect.

ORIGIN: Massachusetts.



ROXBURY RUSSET.

TREE: fairly vigorous, spreading like Greening, but flatter in form of top.

FRUIT: medium to above medium, roundish, oblate, sides not equal; skin tough, green, nearly covered with russet, and having a brownish red cheek when fully exposed to the sun; stem half to three-quarters of an inch long in a medium sized, regular cavity; calyx closed in a round medium sized basin.

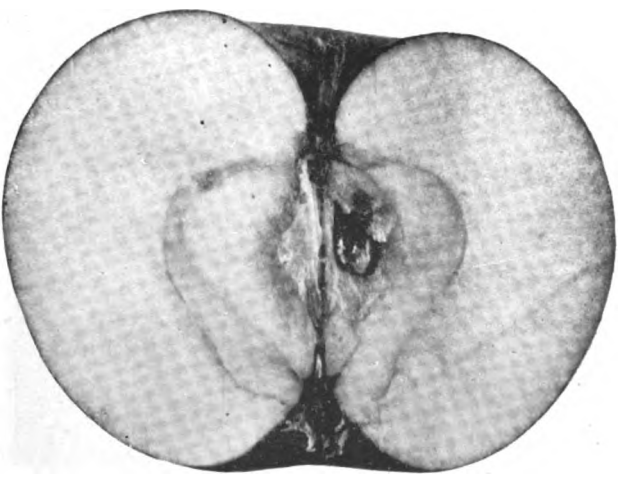
FLESH: yellowish white; texture almost coarse grained, moderately juicy; flavor mild, subacid, pleasant.

QUALITY: dessert, fair; cooking, good.

VALUE: home and foreign markets, good.

SEASON: January to June.

ADAPTATION: long tested in the Niagara district and found to be well adapted to it. As hardy as the Greening, and succeeds in the best apple districts.



SECTION OF ROXBURY RUSSET.

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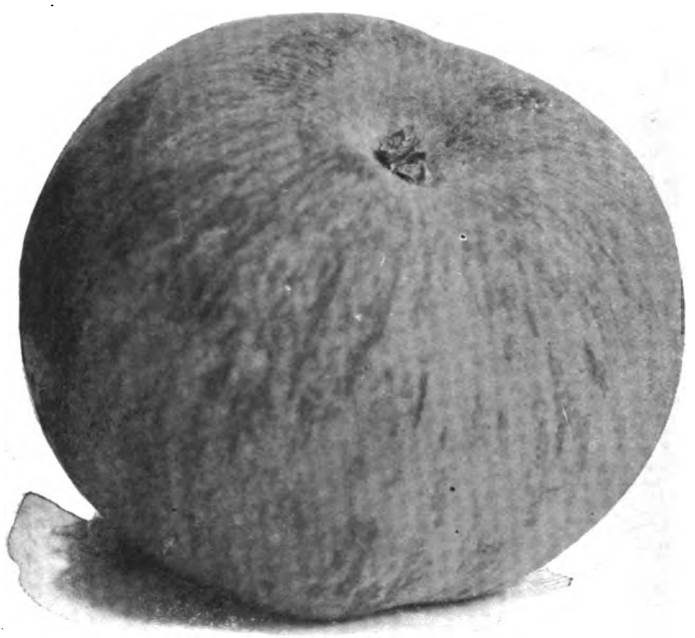
ST. LAWRENCE.

The St. Lawrence apple is not now planted in the commercial orchards of Ontario, bordering on Lakes Ontario, Erie or Huron, being inferior to other autumn varieties of its season, but it is valued in orchards along the St. Lawrence river, and in parts of the province between latitudes 45 and 46. It is rather subject to scab.



ST. LAWRENCE.

ORIGIN: Montreal, Canada.

TREE: hardy, vigorous and productive.

FRUIT: large; form, roundish oblate; color of skin yellowish, with distinct stripes and splashes of carmine; dots obscure; stem five-eighths of an inch long, inserted in a large, deep, regular cavity; calyx closed in a small, deep basin.

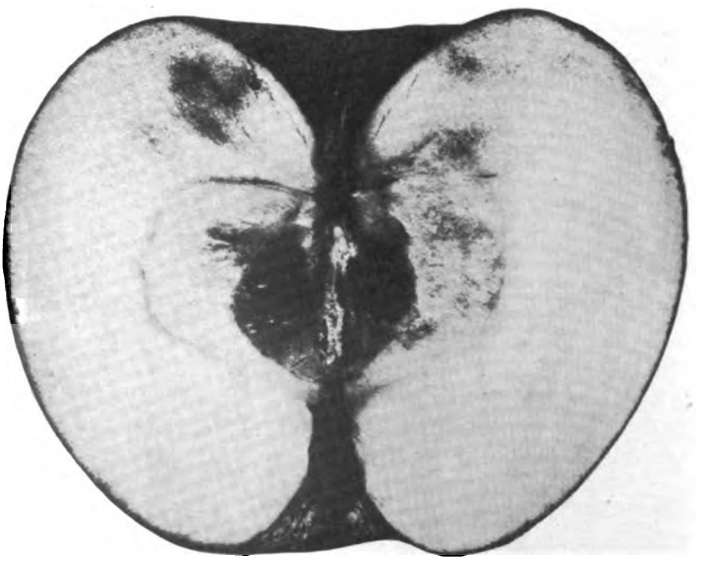
FLESH: color white, slightly stained; texture crisp, tender, juicy; flavor vinous, slightly acid.

QUALITY: dessert good; cooking good.

VALUE: home market, first class; foreign market, second class.

SEASON: September and October.

ADAPTATION: hardy generally over the province, except the extreme north.



SECTION OF ST. LAWRENCE.

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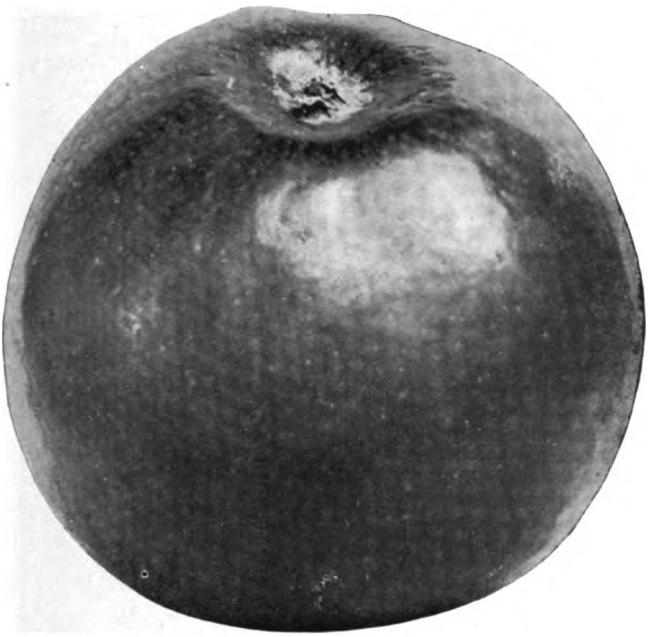
SCARLET PIPPIN.



SCARLET PIPPIN.

A fancy dessert apple which is esteemed profitable to grow for market along the River St. Lawrence and Ottawa Valley.

ORIGIN: near Brockville in Leeds County. A chance seedling.

TREE: upright in habit; hardy; vigorous and very productive; inclined to overbear.

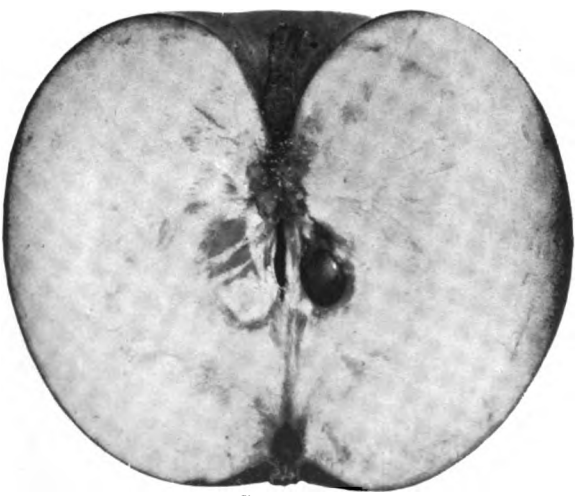
FRUIT: medium size roundish oblate; skin, waxy white, streaked; splashed or almost entirely covered with bright scarlet covering; stem stout, one-half to three-quarters of an inch long in a narrow, moderately deep cavity; calyx closed in a narrow, very shallow basin.

FLESH: pure white, texture tender, fine, crisp, breaking juicy, with a subacid flavor.

QUALITY: dessert, best; cooking, good.

VALUE: special market, first class.

SEASON: October to February; at its best in October and November.



SECTION OF SCARLET PIPPIN.

SALOME.

A Western apple which promises to be of some value in the Province of Ontario. The hardiness of the tree, the clean bright color of the fruit and its long keeping quality seem to combine in its favor as a commercial variety, especially in the colder sections.

ORIGIN: Ottawa, Illinois; propagated by E. C. Hathaway.

TREE: hardy, productive, a slow grower, an early and an annual bearer.

FRUIT: size medium; form roundish, conical, somewhat angular or lopsided; color bright red with stripes of darker red and numerous small grey dots on a yellowish

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ground; when harvested the skin is green, but during the winter it takes on the coloring above described, making it very attractive; stem stout, three-quarters of an inch long, set in a deep, uneven cavity; calyx half closed, segments erect, in a moderately deep, slightly plaited basin, having five distinct prominences; core large, open, sessile.

FLESH: color yellowish; texture tender, firm, becoming toward spring moderately juicy; flavor pleasant, subacid.

QUALITY: dessert, fair; cooking, good.

VALUE: promising for export.

SEASON: November to March.

ADAPTATION: succeeds remarkably well in the County of Simcoe and at other favored points in the north.

SCOTT WINTER.

SCOTT WINTER.

In the Province of Quebec this is considered the best late winter cooking apple, the tree being very hardy and the fruit a long keeper; useful for the northerly limits of apple culture.

ORIGIN: On the Scott farm Newport Vermont. Introduced by Dr. Hoskins, of Newport.

TREE: vigorous; habit upright; productive, an early bearer.

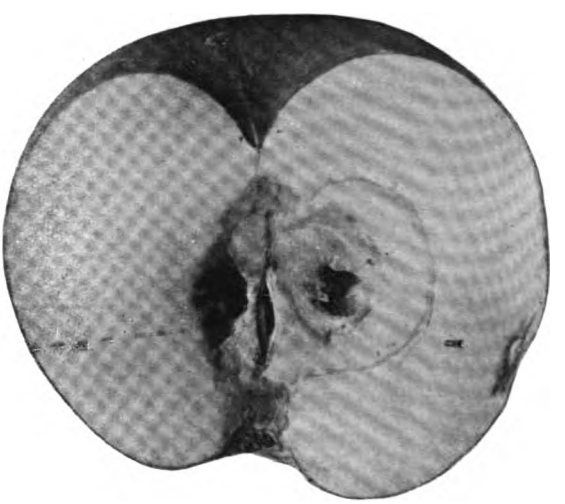
FRUIT: size small to medium; form roundish oblate, slightly conical; skin yellow, washed, striped and splashed with red; stem short set in a regular, deep, russeted cavity; calyx closed in a narrow, abrupt, wavy basin.

FLESH: color yellow; texture fine grained, crisp, juicy; flavor pleasant, sprightly acid.

QUALITY: dessert, fair; cooking, good.

VALUE: fruit rather small for market except under high cultivation.

SEASON: late winter.



SECTION OF SCOTT WINTER.

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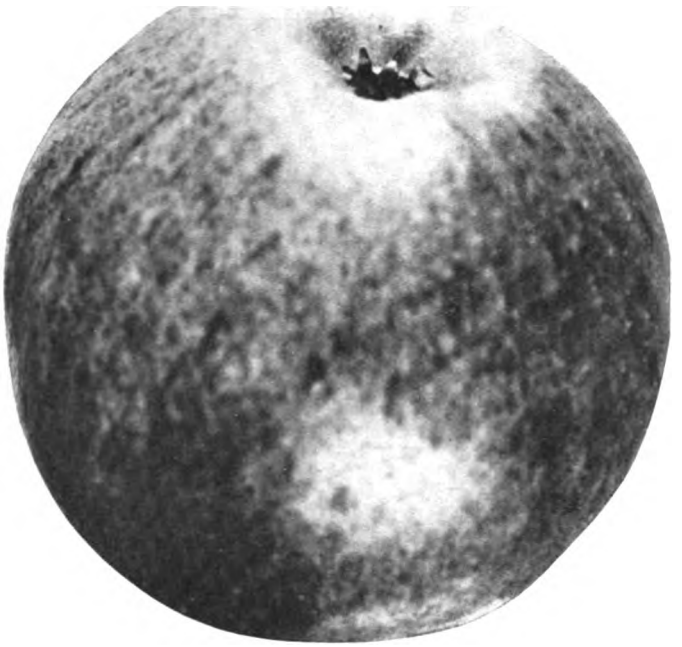
SEEK-NO-FURTHER.



SEEK-NO-FURTHER.

An old commercial variety, at one time considerably planted in some parts of Ontario, and still highly valued by some apple growers. Not much planted in the newer orchards.

ORIGIN: near Westfield, Connecticut, U.S.A., about 1796.

TREE: vigorous, hardy; habit spreading; productive. Succeeds best on rich sandy loam.

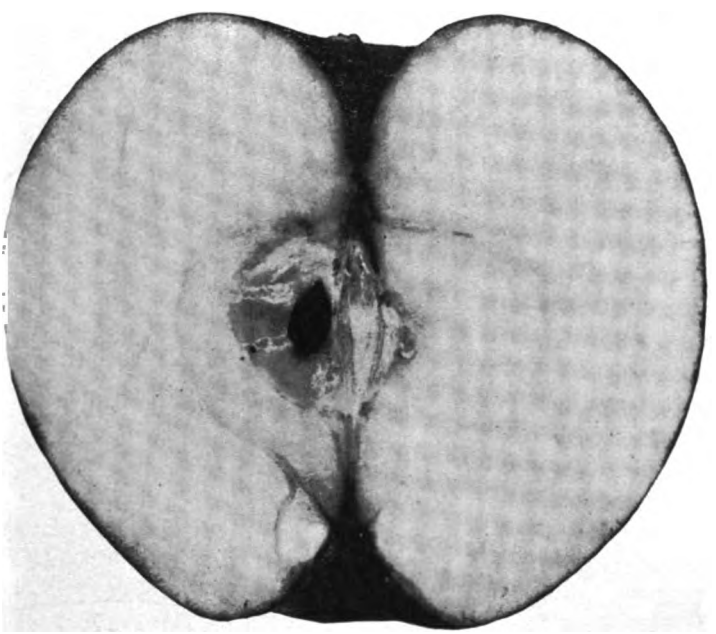
FRUIT: size medium to above; form roundish conical; skin greenish yellow shaded with dull red, striped with bright red, with russet veinings and a few large prominent yellow dots; stem short in a deep, slightly russeted cavity; calyx usually open in a narrow, shallow leather cracked basin; not subject to scab.

FLESH: yellowish white; fine grained, tender; flavor spicy, pleasant, subacid.

QUALITY: dessert, very good; cooking, fair.

VALUE: market, first class.

SEASON: October to February.



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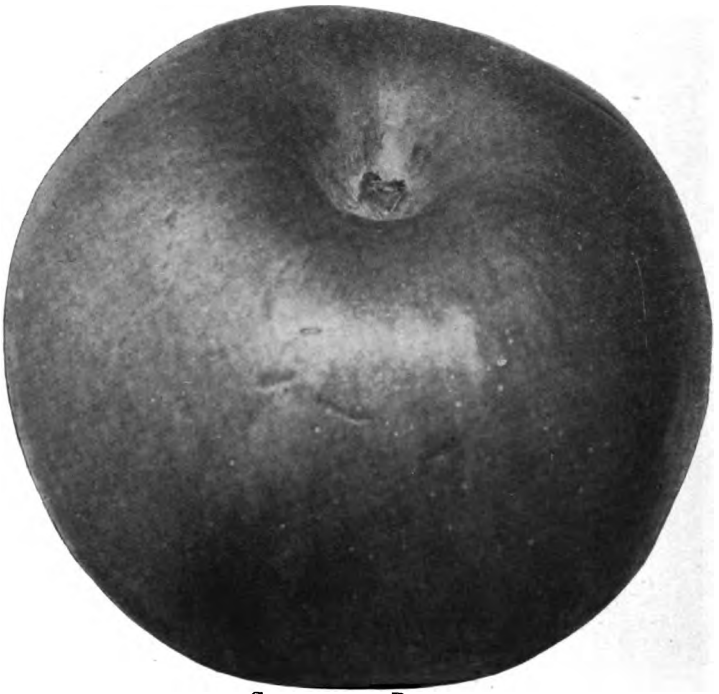
SHIAWASSEE (*Shiawassee Beauty*).



SHIAWASSEE BEAUTY.

A fine variety of the Fameuse type; much less subject to scab than Fameuse itself. A fancy variety for dessert purposes.

ORIGIN: in Shiawassee County, Michigan, supposed to be a seedling of Fameuse.

TREE: hardy, vigorous; upright; productive alternate years.

FRUIT: size medium to large; form decidedly oblate; color yellowish ground, almost entirely covered with stripes, splashings and mottlings of dark crimson, and a few large prominent yellowish dots; stem slender, three-quarters of an inch long, set in a broad, deep cavity; calyx usually closed, in a large deep basin.

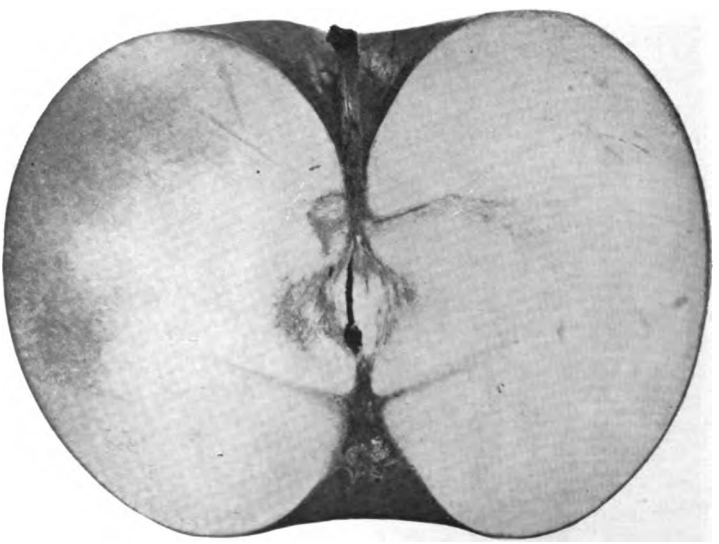
FLESH: color very white; texture firm, very crisp, juicy, fine grained; flavor excellent.

QUALITY: cooking, fair; dessert very good.

VALUE: home or foreign market promising.

SEASON: October to January.

ADAPTATION: Can be grown wherever Fameuse succeeds.



SECTION OF SHIAWASSEE BEAUTY.

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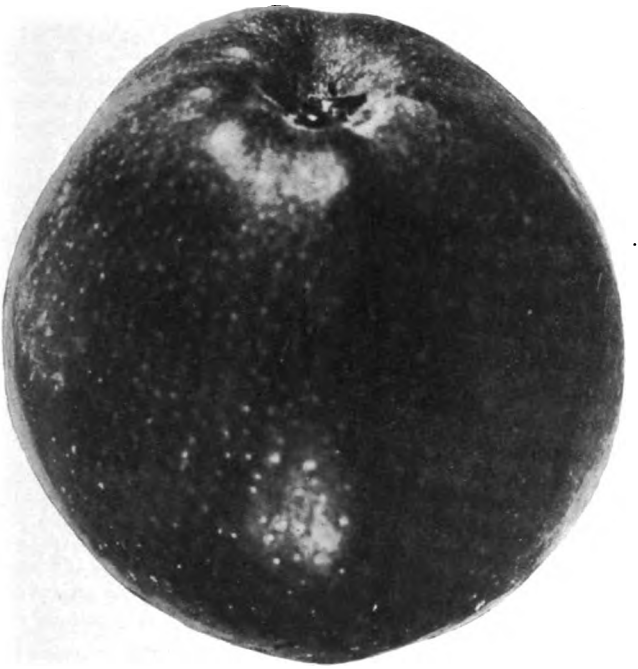
SPITZENBURG (*Esopus*).

One of the finest dessert apples for late winter use, and widely planted by early settlers throughout Southern Ontario. It has proved to be unprofitable as a commercial apple in Ontario because the tree is a weak grower, and yields small crops.



SPITZENBURG.

ORIGIN: Esopus, on the Hudson river, previous to 1798.

TREE: lacking in vigor, often showing dead or feeble wood; upright, spreading, with drooping limbs when in bearing; fairly hardy.

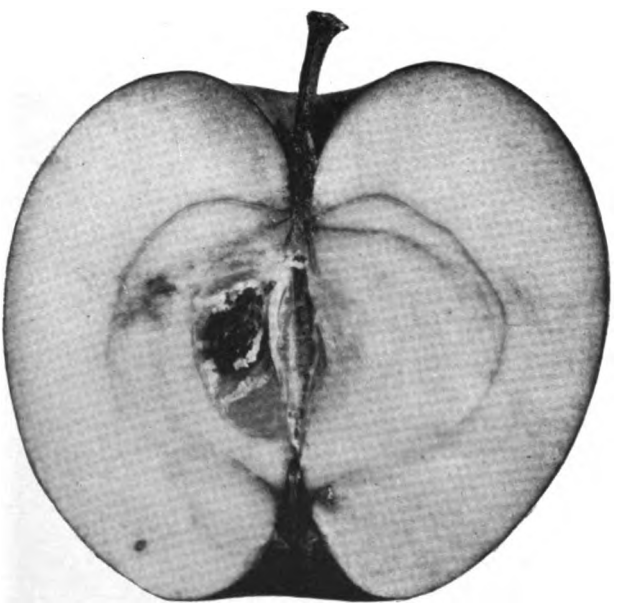
FRUIT: size medium to large, oblong, slightly conical; skin straw color in shade, but usually nearly covered with bright red, and dark red in sun, with a few stripes, and many obscure gray dots; stalk seven-eighths of an inch long in a narrow, deep cavity; calyx nearly closed, set in a narrow basin of medium depth, slightly corrugated.

FLESH: yellowish white; texture crisp, juicy, breaking; flavor brisk, rich, delicious.

QUALITY: first class for all purposes.

SEASON: November to February.

ADAPTATION: succeeds well on sandy loam in Southern Ontario.



SECTION OF SPITZENBURG.

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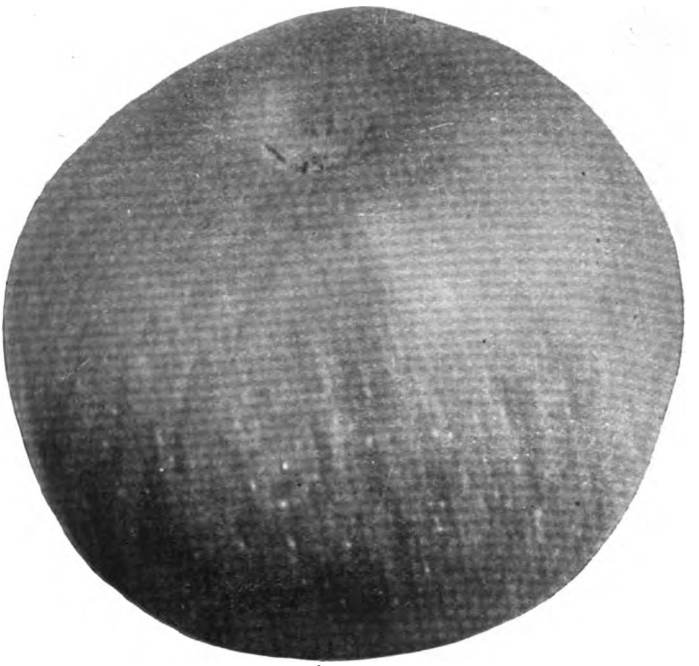
SPY (*Northern Spy*).

The Spy stands in the very first rank of Canadian apples whether for home or foreign markets. Originating in New York State on the line with the southern portion of the Province of Ontario it succeeds here to perfection. Its beauty of coloring half shaded by its delicate bloom and its great excellence of quality for all purposes, justly claim for it its wide popularity. In Chicago, Canadian Spys are more sought for than any other variety, but owing to tenderness of skin, which shows the slightest bruise, it is less popular for export to Great Britain than some other varieties. The tree is late in coming into bearing, often being fifteen years planted before yielding a crop, and this renders the variety somewhat unpopular with planters. Probably for fancy packages, selected Spys would be among the best.



SPY.

ORIGIN: near Rochester, N.Y., introduced about 1850.

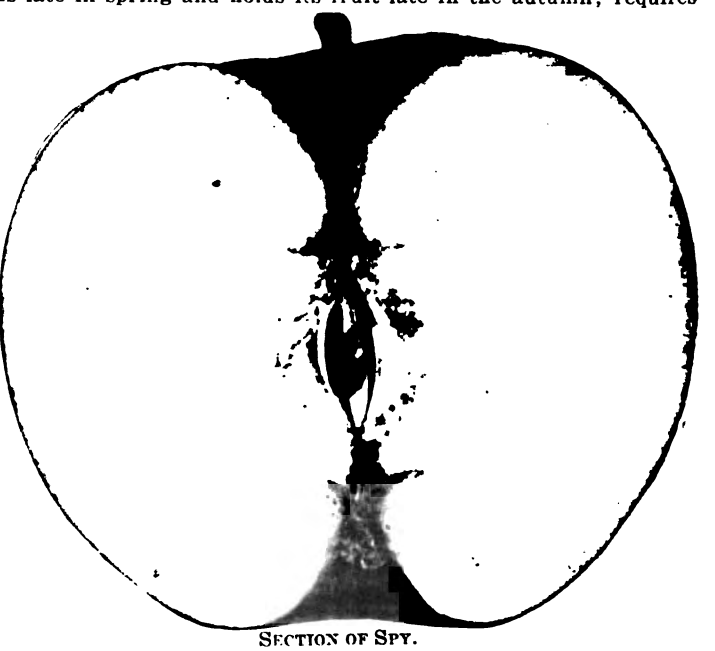
TREE: upright and spreading in habit; fruit spurs on interior boughs; very vigorous, late in coming into bearing, but afterwards productive in alternate years; blossoms late in spring and holds its fruit late in the autumn; requires high cultivation and good fertility.

FRUIT: large to very large; form roundish, slightly conical; skin thin, light green, or pale yellow, sprinkled with light pink, striped and shaded with pinkish red, and covered with thin whitish bloom; stalk slender three-quarters of an inch long, in a wide deep, sometimes russeted cavity; calyx small, closed, in a narrow, moderately deep, abrupt, irregular basin.

FLESH: yellowish white; texture fine grained, crisp, tender, juicy; flavor rich, sprightly, subacid, fragrant.

QUALITY: dessert and cooking, best.

VALUE: home market and export, first class.



SECTION OF SPY.

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SEASON: January to May.
ADAPTATION: sandy or clay loams in Southern and Middle Ontario; found tender at the St. Lawrence Experiment station, and also at the Lake Simcoe station, except where top grafted to hardy stock.

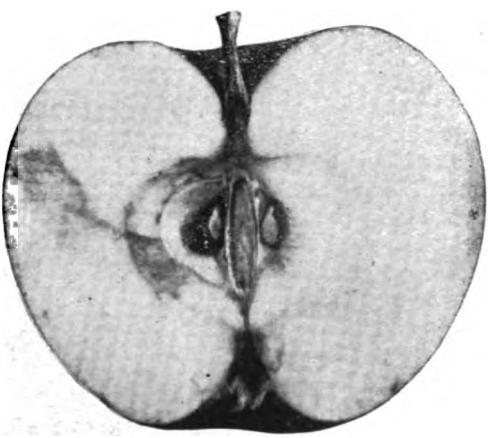
STUMP.

An attractive looking fall apple.
ORIGIN: United States; probably in Monroe County, N.Y.
TREE: spreading, productive.
FRUIT: size medium; form oblate conical; color yellowish, splashed and blotched with bright red; stem stout, three-eighths of an inch long, in a narrow, moderately deep, funnel-shaped cavity; calyx half open, set in a shallow, narrow, abrupt basin.
FLESH: color white; texture crisp, juicy, firm; flavor subacid.
QUALITY: fair for dessert; good for cooking.
VALUE: home market, first class; foreign market, second class.
SEASON: September and October.

SWAYZIE (*Swazie Pomme Grise*).

There is no choicer winter dessert apple for the months of December and January than the Swazie Pomme Grise, especially when kept in a cool, dark cellar, so that its crisp texture and excellent flavor may be preserved. Unfortunately, it is not very productive, and consequently not profitable. One large tree at Maplehurst, seventy-five years planted, yielded only an average of four barrels each alternate year. It is well worthy of a place in the amateur collection.
ORIGIN: probably with Col. Swayzie, near Niagara.
TREE: upright, fairy vigorous and not very productive.
FRUIT: small, round, oblate, conical; color deep yellow, well colored with cinnamon

SWAYZIE.



SECTION OF SWAYZIE.

russet and many whitish dots; stem three-quarters of an inch long, set in a deep cavity; calyx closed in a moderately deep, slightly corrugated basin.
FLESH: white, texture fine grained, tender, crisp, juicy; flavor aromatic, mild subacid, pleasant.
QUALITY: dessert, first class; cooking, third class.
VALUE: for home market, second class; for foreign market, second class.
SEASON: December to March.
ADAPTATION: succeeds in best apple districts.

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STARK.

STARK.

The Stark has been tested in a commercial way in Ontario by many growers in the Bay of Quinte District, and is considered a good winter apple for export, being about as profitable as Ben Davis, and somewhat better in quality; its dull red color is a serious fault.

ORIGIN: Ohio.

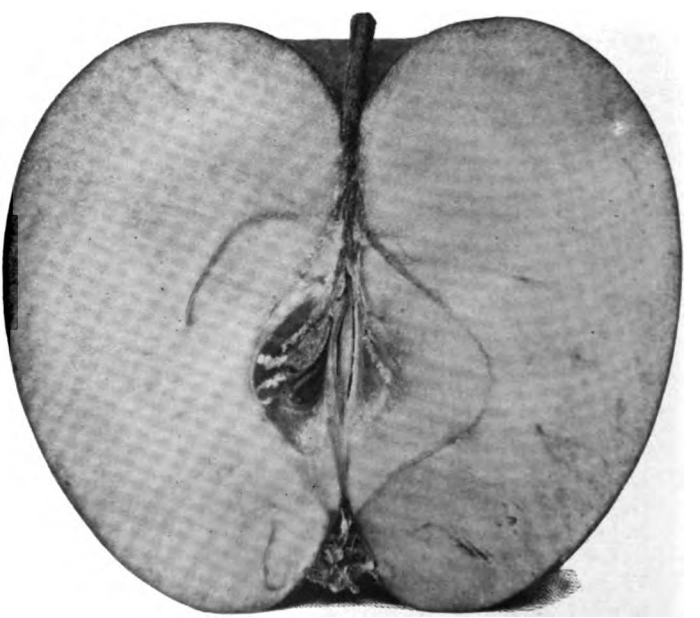
TREE: a stout vigorous grower, very productive each alternate year; foliage large, dark green, somewhat subject to fungus.

FRUIT: large form; roundish, slightly one-sided, somewhat oblong conical; skin covered with shades and splashes of light and dark red on a greenish yellow ground, thickly sprinkled with brown dots; stalk one-half inch long, stout, in a small cavity of medium depth; calyx large, half-closed, in a large shallow, plaited basin; flesh yellowish white; texture a little coarse, firm and moderately juicy; flavor mild, subacid, good.

QUALITY: dessert, poor; cooking, good.

VALUE: second class.

SEASON: January to May.



SECTION OF STARK.

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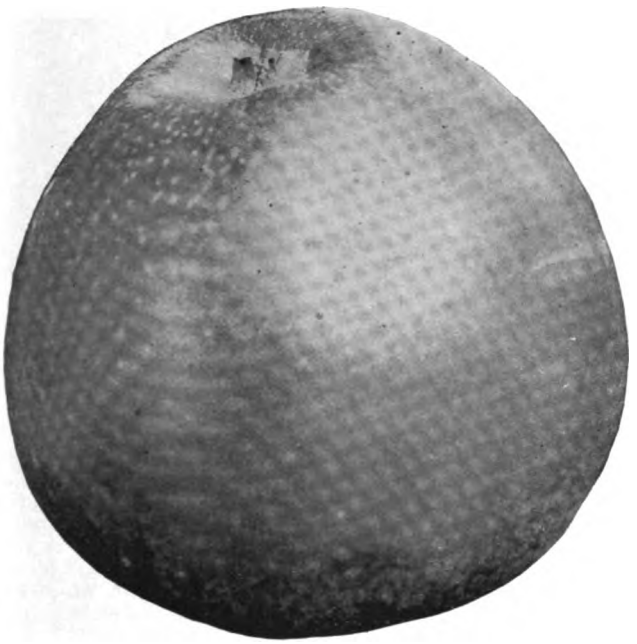
SWEET BOUGH (*Large Yellow Bough of Downing*).



SWEET BOUGH.

An excellent dessert apple, ripening about the same season as the Early Harvest; not subject to scab, and a favorite with those who prefer a sweet to a sour apple. Not profitable to grow for market, but it deserves a place in every collection for home use. Baked whole it is delicious eaten with cream.

ORIGIN: United States.

TREE: of medium vigor, never attaining a large size, and, therefore, even with a full crop, not very productive. Bears full every alternate year; head compact.

FRUIT: large, ovate, conical; skin smooth, greenish yellow; stem one inch long, in a narrow, deep, regular cavity; calyx open, in a shallow, irregular basin.

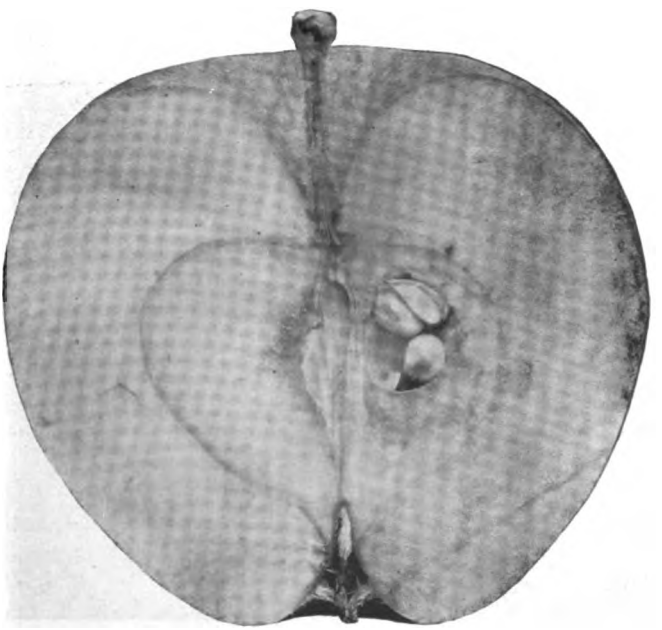
FLESH: white, fine grained, tender and juicy; flavor moderately sweet, rich and agreeable.

QUALITY: dessert very good; cooking good.

VALUE: home market, second class; foreign market, useless.

SEASON: late July and August.

ADAPTATION: succeeds in best apple districts.



SECTION OF SWEET BOUGH.

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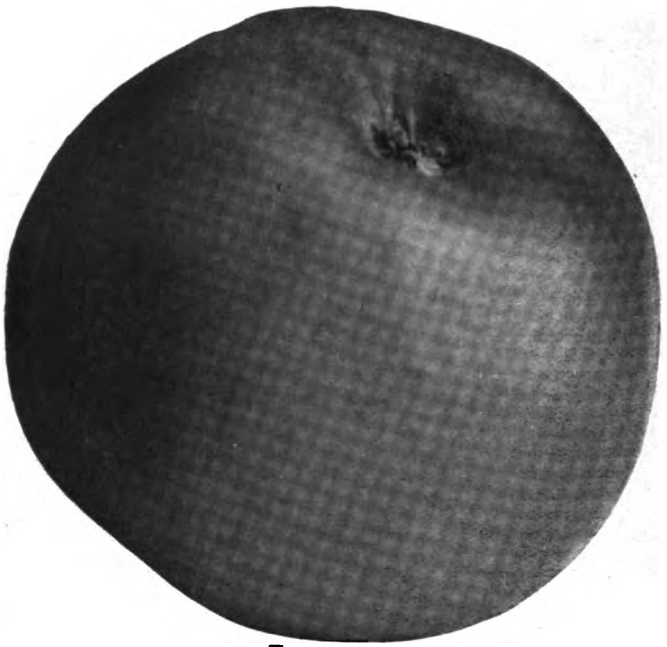
TOLMAN.

(*Tallman Sweet.*)



TOLMAN.

The best winter sweet apple; valuable for baking and by some people esteemed a good dessert apple; useful also as stock feed, in place of roots; not of much value for export.

ORIGIN: a native of Rhode Island.

TREE: a vigorous grower, very productive and very hardy; valuable as a stock upon which to top graft other and more tender varieties, as, for example, the King, which is more productive, and the Spy, which may be grown farther north when top grafted upon the Tolman than when upon common stock.

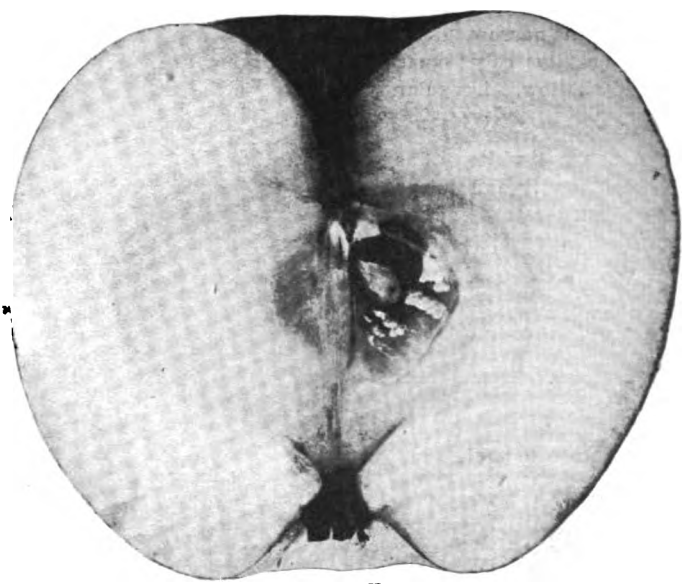
FRUIT: size medium; form roundish; color light yellow, sometimes with reddish cheek, and a line from stem to calyx; stem half an inch long, often inclined, inserted in a wide shallow cavity; calyx closed in a small shallow basin.

FLESH: color white; texture firm, fine grained; flavor sweet, rich.

QUALITY: dessert, good; cooking, good.

VALUE: second class, except in special markets and in limited quantities.

SEASON: November to April.



SECTION OF TOLMAN.

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TRENTON.

TRENTON.

ORIGIN: seed of Golden Russet by Spy, raised by Mr. P. Dempsey, Albury, Prince Edward County.

TREE: vigorous; spreading.

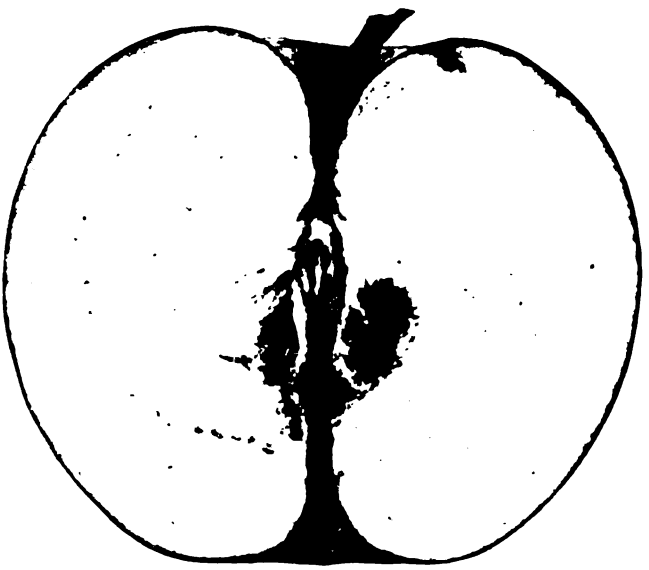
FRUIT: size medium; color red on yellow ground with numerous splashes and stripes of dark red and many white dots; form round oblate; stem five-eighths of an inch long in a deep cavity; calyx partly open in a deep basin.

FLESH: color yellow; texture tender, crisp, juicy; flavor pleasant, subacid.

QUALITY: dessert, good.

VALUE: second class.

SEASON: September and October.



SECTION OF TRENTON.

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TITOVKA (*Titus Apple*).

A variety as yet little known or tested in Canada. In season it follows the Duchess. It is a favorite market apple in middle Russia and is found to endure the severest winters. At Grimsby, grown as a top graft it is inclined to drop its fruit about the middle of August, and almost before fully colored.

ORIGIN: Russia.

TREE: very hardy and productive.

FRUIT: large, oblong to roundish, often flattened at base and apex, somewhat irregular on sides; color yellowish green, almost covered with stripes and shadings of bright red, and light green dots; cavity narrow, deep and irregular; stem about three-quarters of an inch long, stout; basin large, plaited at bottom; calyx nearly closed, segments recurved.

FLESH: white; texture firm, moderately juicy; flavor brisk, tart.

QUALITY: dessert, poor; cooking, good.

VALUE: home market first class.

SEASON: August and September.

ADAPTATION: worthy of trial where Wealthy or Duchess succeed.

TRANSCENDENT.

An excellent early autumn variety of the hybrid crabs.

ORIGIN: United States.

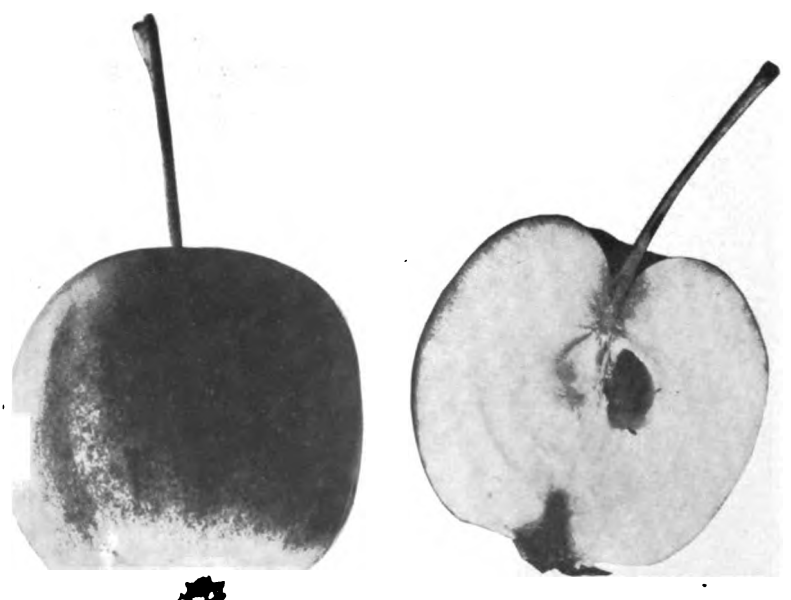
TREE: of moderate slender growth, hardy, somewhat subject to twig blight.

FRUIT: medium for its class; form roundish oblong, flattened at ends, ribbed; color of skin golden yellow, with crimson cheek and thin whitish bloom; stem one and a quarter inches long, set in an open deep cavity; calyx closed, segments large, set in a hollow slightly corrugated basin; somewhat subject to scab.

FLESH: color yellowish; texture crisp and moderately firm; flavor acid, slightly astringent, becoming pleasant when fully ripe.

VALUE: good.

SEASON: August and September.



TRANSCENDENT.

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WAGENER.

A fine dessert apple when grown and highly colored, but samples grown in the shade are inferior both in appearance and in flavor. The texture of the fruit is too tender to be planted in the commercial orchard.

WAGENER.

ORIGIN: Abram Wagener, Penn Yan, N.Y., in 1796.

TREE: a slow grower and an early bearer; not long-lived. An excellent variety to be used as a filler.

FRUIT: medium to large, form oblate; color yellow, nearly covered with crimson, obscurely striped, with a few light dots; stem about seven-eighths of an inch long, inserted in a broad, deep, irregular cavity; calyx closed, set in a funnel form, somewhat corrugated basin.

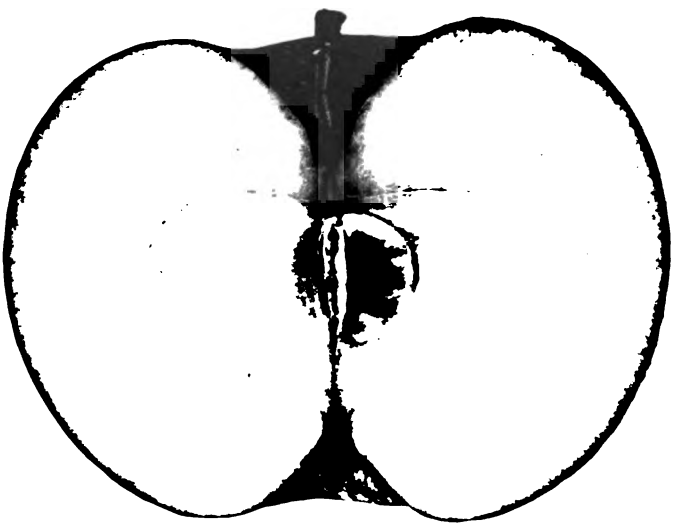
FLESH: yellowish, texture fine grained, very tender, juicy; flavor subacid, very agreeable.

QUALITY: dessert, very good; cooking, good.

VALUE: home market, first class; foreign market, second class.

SEASON: November to February.

ADAPTATION: succeeds in best apple sections.



SECTION OF WAGENER.

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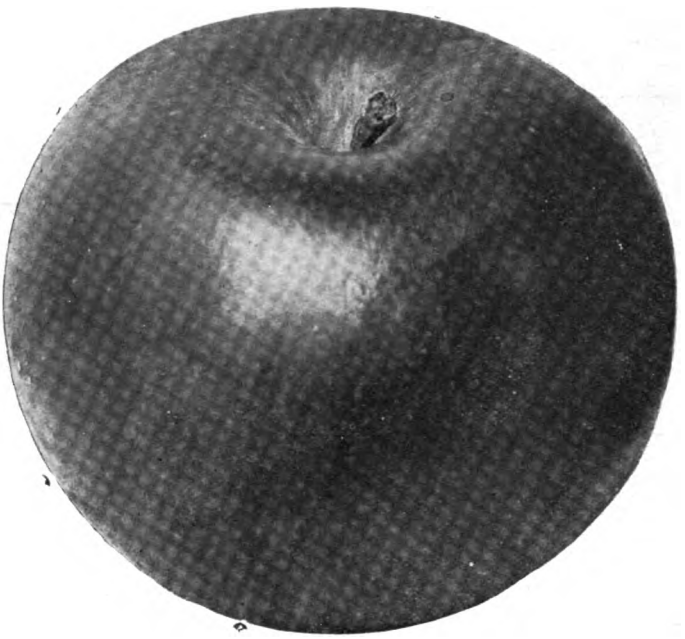
WEALTHY.

This beautiful apple was distributed among the members of the Ontario Fruit Growers' Association in 1882 for trial, and has won for itself a good reputation in every part of the Province as a dessert apple of excellent quality, while in the northern portions it is especially desirable on account of its hardiness.



WEALTHY.

ORIGIN: St. Paul, Minnesota, by Peter Gideon.

TREE: vigorous, very hardy, over productive.

FRUIT: medium, roundish, oblate, regular; skin, smooth, greenish ground, changing to pale yellow, rich, red cheek, with stripes and splashes of red in the sun, sometimes nearly covered with crimson; stem one-half to three-quarters of an inch long in a deep, regular cavity; calyx nearly closed in a deep, abrupt basin.

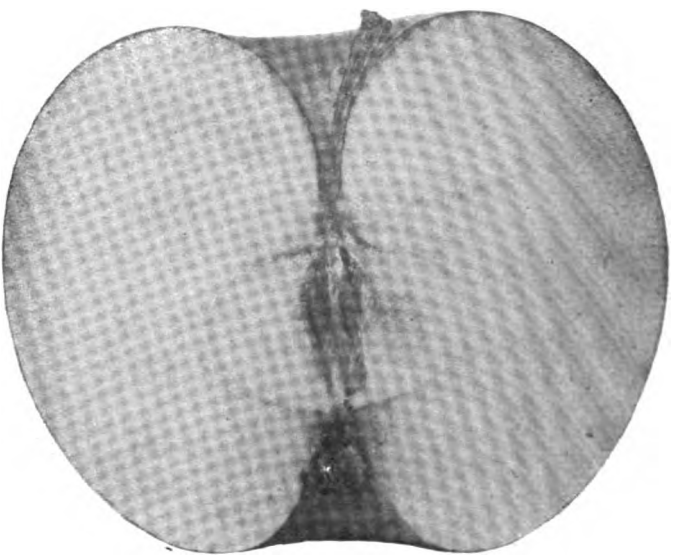
FLESH: white, texture fine grained, tender, juicy, sprightly, pleasant, subacid.

QUALITY: dessert good; cooking, good.

VALUE: for home market, first class; for foreign market, first class.

SEASON: September to November.

ADAPTATION: succeeds throughout the Province generally.



SECTION OF WEALTHY.

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VANDEVERE.

An old variety originated at Wilmington, Delaware.

FRUIT: medium oblate; surface waxen yellow, striped with red; dots numerous, green; cavity deep; stem about one inch long; basin round, moderate; calyx small, closed.

FLESH: yellowish, compact, but tender, with a fine rich subacid flavor; good; valuable for culinary use. October to January. (*Budd.*)

WALBRIDGE (*Edgar Redstreak*).

A good winter variety for northern sections, on account of the hardiness of the tree, but not commended for the apple orchards of the more favored districts.

ORIGIN: Edgar Co., Illinois, and first known as Edgar Redstreak.

TREE: vigorous; habit spreading; a tardy and often a shy bearer.

FRUIT: size small; form round conic; skin pale yellow, shaded with pale red and having stripes and splashes of bright red on the sunny side, and a few obscure whitish dots; stem short in an acute regular cavity; calyx closed in a narrow flat basin.

FLESH: color white; texture tender, juicy; flavor mild subacid.

QUALITY: dessert, fair; cooking, good, but rather small.

VALUE: market, second class.

SEASON: December to March.

WOLF RIVER.

The Wolf River is an apple that might be included in a list for export. It is a little later in season than Alexander, and is supplanting that variety in some sections.

ORIGIN: a seedling of the Alexander, and originated in Wisconsin on the bank of Wolf River.

TREE: very hardy, vigorous and fairly productive; an early bearer.

FRUIT: very large, oblate, or roundish oblate, usually regular in size; skin light yellow, shaded with dark red or crimson in sun, with a few yellowish dots; stem three-quarters of an inch long, set in a narrow deep basin, of a green or russet color; calyx open, in a narrow, deep, green, wrinkled basin.

FLESH: yellowish white, moderately firm in texture, not fine grained, juicy, with a pleasant subacid flavor.

SEASON: October and November.

ADAPTATION: general throughout the Province, but specially successful in the north.

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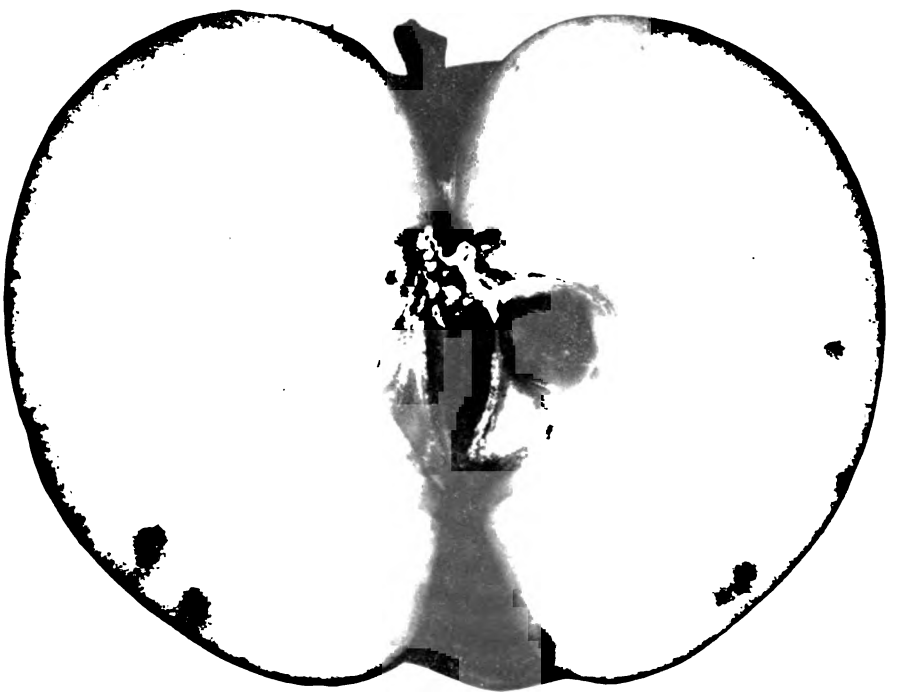
Wolf River.



Section of Wolf River.

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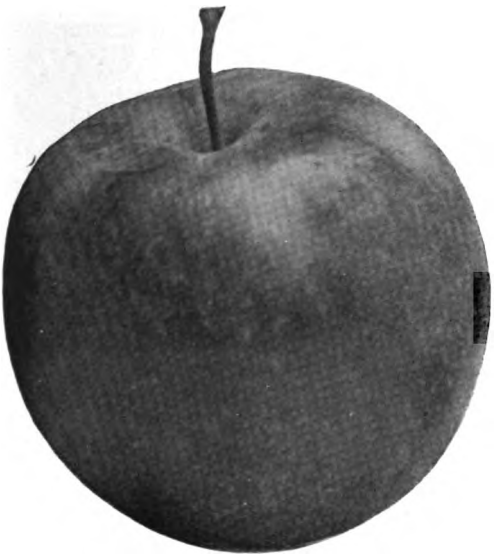
WHITNEY (*Whitney No. 20*).

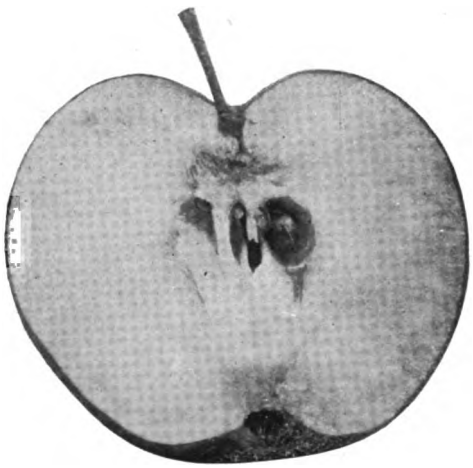
A hybrid crab, which originated in Illinois and has proved itself valuable in Northern Illinois, in Minnesota, and in some parts of our Canadian Northwest. As long ago as 1894, this apple was in bearing at Prince Albert in Alberta.

The apple is large for its class; it is a good cooking apple and a fair dessert apple.

TREE: productive; very hardy.



WHITNEY.



SECTION OF WHITNEY.

FRUIT: medium size; form roundish conical, slightly angular; color dark red, splashed with dark crimson on a yellow ground, with obscure small white dots; stem one inch long set in a flat wrinkled basin; calyx closed in a regular slightly russeted basin.

FLESH: color yellowish; texture tender, juicy; flavor subacid.

QUALITY: cooking, very good; dessert, good.

VALUE: special market, first class.

SEASON: August to September.

YORK IMPERIAL.

A fine export market apple, highly valued in some of the American States, but not yet much grown in Ontario.

ORIGIN: York County, Pa.

TREE: a moderate grower, productive.

FRUIT: medium in size: angular, oblique; color of skin, bright red in shades, stripes and splashes on a yellowish ground; stem half an inch long in a deep funnel-shaped cavity; calyx nearly closed in an irregular deep, slightly plaited basin.

FLESH: yellowish; texture firm and juicy; flavor subacid, good.

QUALITY: dessert, fair; cooking, good.

VALUE: first class for market.

SEASON: January to March.

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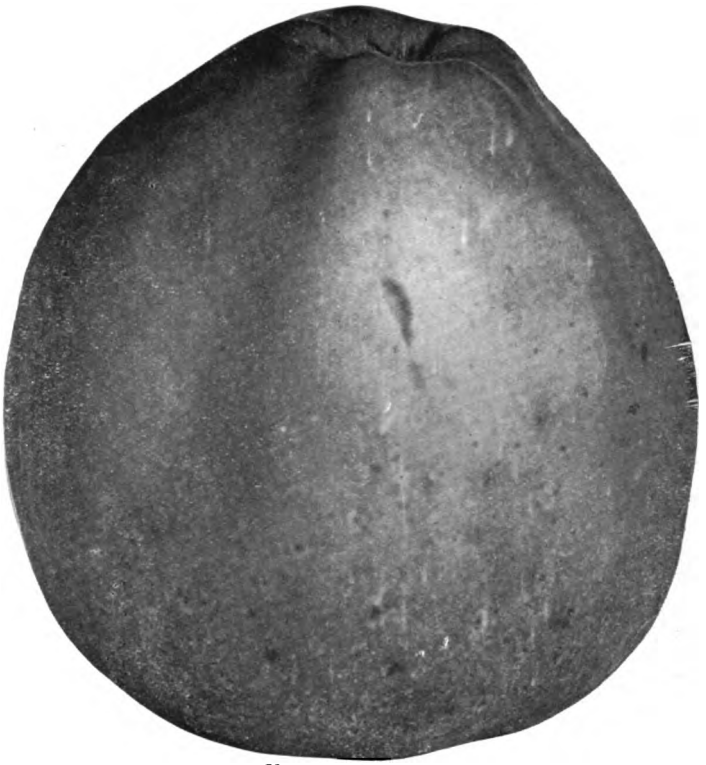
YELLOW BELLFLOWER (*Bishop's Pippin of Nova Scotia*).



YELLOW BELLFLOWER.

At one time the Bellflower was planted to some extent in Ontario orchards but the tree has proved itself irregular in its bearing habits, sometimes producing magnificent samples, and at other times small and poorly colored fruit, and the fruit is tender and shows very slight bruises, so that we cannot recommend it as worthy of a place among the most profitable varieties.

ORIGIN: Burlington, N.J.

TREE: vigorous, forming a roundish, spreading and somewhat drooping head; productive alternate years.

FRUIT: size large, form apparently oblong because tapering towards calyx, somewhat angular and ribbed; color pale yellow, often with a beautiful blush on the sunny side and numerous obscure whitish dots; stem slender, one inch long, in a narrow deep cavity; calyx closed in a small corrugated basin.

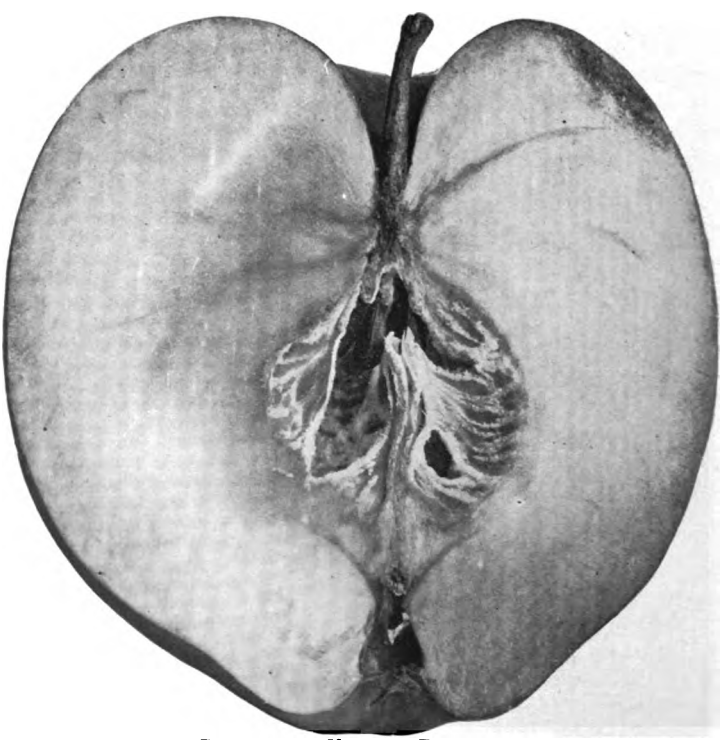
FLESH: color yellow; texture tender, juicy and crisp; flavor sprightly subacid agreeable when eaten in season.

QUALITY: dessert, good; cooking, good.

VALUE: home market, first class.

SEASON: December to February.

ADAPTATION: general, except in extreme northern sections.



SECTION OF YELLOW BELLFLOWER.

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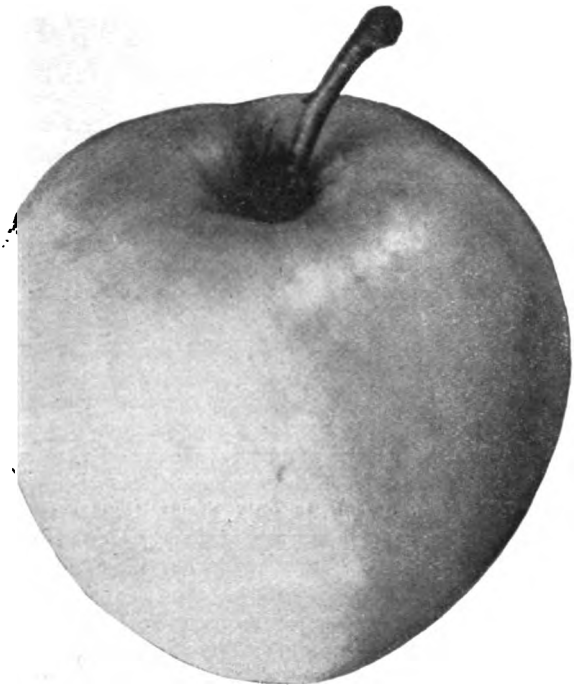
YELLOW TRANSPARENT.



YELLOW TRANSPARENT.

This variety seems to be proof against fusicladium, both in leaf and fruit.

ORIGIN: St. Petersburg, Russia. Imported by the U. S. Department of Agriculture in 1870.

TREE: hardy, vigorous, upright, an early and an annual bearer, productive.

FRUIT: medium, roundish, oblate, inclined to be conical; skin clear white, yellowish white when very mature; dots light green, obscure; stalk medium, in large cavity; calyx closed in medium, slightly corrugated basin; fruit hangs well on the tree.

FLESH: white; texture firm till very ripe, then tender.

QUALITY: second class.

VALUE: good early apple for local market.

SEASON: early August.

ADAPTATION: succeeds almost everywhere over the Province.

SECTION OF YELLOW TRANSPARENT.

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THE CHERRY.

The cherry, which for a time was a comparatively neglected fruit in Ontario, is now being largely planted and better culture is being given it. As a result, this delicious fruit is now being produced in fairly large quantities in certain sections, and as the crop is more uncertain than that of any other large fruits, the prices obtained for cherries are good.

There are three well recognized groups into which the cultivated cherries are divided, the Morello, or Sour cherries; the Bigarreau, Heart, or Sweet cherries, and the Duke cherries, which are intermediate between the other two groups, the fruit being usually subacid. The hardiest varieties are found in the Morello group, and for this reason these Sour cherries have succeeded over a much larger part of Ontario than the others. The eastern limit of the commercial culture of the Sour cherries is about the city of Kingston, but northeast of that district along the St. Lawrence River, especially within twenty or thirty miles of the water, they succeed admirably. They are not grown to any extent north of latitude 45 degrees, as it has been found that the dry cold winters kill the fruit buds, and it is only rarely that a crop is produced. Near the northern limit of the successful culture of Sour cherries, it has been found that large bodies of water have a beneficial influence in lessening the winter injury.

The Sweet and Duke cherries have a much narrower range than the Sour cherries. While they will succeed along Lake Ontario east of Toronto, where the influence of the water moderates the climate, the crops are too uncertain for their commercial culture, hence this is confined mainly to the south-western parts of the Province.

More care is required in choosing a site for cherries than for apples. A warm sandy loam or gravelly well-drained soil is to be preferred, and while the tree may succeed for a time on poorly drained soil, they will not reach a great age, and are not likely to prove profitable. A site should, if possible, be chosen where there is the least danger from spring and summer frosts, as cherry blossoms are tender.

The preparation of the land for apple trees and directions for planting of the same may be followed for the cherry, but even more care should be taken in planting, as cherries are much harder to transplant than apples. For this reason, one or two year old trees should be used, as the loss from planting older trees is liable to be great.

As the trees of the Morello cherries do not reach a great size, they may be planted closer than the others; from eighteen to twenty feet apart being sufficient; while for the Sweet cherries, twenty-five feet is not too much. The Duke cherries, which do not grow quite so large as the Sweet, may be planted about twenty feet apart.

The pruning to shape the cherry tree is much the same as for the apple, but after the tree becomes well shaped, the less pruning done the better. Often serious injury occurs when cherry trees are severely pruned. Gum oozing from the tree is an indication of such injury.

Thorough cultivation is as necessary for cherries as for apples, and cover crops are, if anything, more necessary.

VARIETIES RECOMMENDED.

General List Approved by the Board of Control.

Hardy varieties suitable for any portion of the Province bounded by Lakes Ontario, Erie, Huron and the Georgian Bay: Orel, Richmond, Montmorency, Russian 207. For southern sections, see district lists.

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DISTRICT LISTS.

NIAGARA DISTRICT.

(Including the Niagara Peninsula from the Niagara River to Hamilton and north to the escarpment.)

E. D. SMITH, WINONA.

Sour: Richmond, Montmorency, English Morello.
Sweet: White—Gov. Wood, Napoleon. Black—Knight, Tartarian, Mezel, Windsor, Schmidt Bigarreau (for clay only).

F. G. STEWART, HOMER.

Sour: Richmond, Montmorency. (The English Morello, Ostheim and Wragg ripen late here, and are apt to be stung before they are harvested.)
Sweet: White—Gov. Wood, Elton, Napoleon, Spanish. Black—Tartarian, Elkhorn, Windsor.

FONTHILL DISTRICT.

(Including Townships of Pelham, Stamford and Thorold.)

G. C. BROWN, FONTHILL.

Sour: Richmond, Montmorency.
Sweet: Tartarian, Knight, Napoleon, Gov. Wood, Windsor.

BURLINGTON-OAKVILLE DISTRICT.

(Including the southern part of the counties bordering on Lake Ontario between Hamilton and Toronto.

A. W. PEART, BURLINGTON.

Dyehouse, Richmond, Windsor, Montmorency, English Morello.

LAKE SIMCOE DISTRICT.

(Including the northern and eastern section of Simcoe and northern sections of York and Ontario bordering on Lake Simcoe.)

G. C. CASTON, CRAIGHURST.

Orel 25, Ostheim, Montmorency, Dyehouse, English Morello.

OTTAWA DISTRICT.

(Including the Ottawa Valley and the eastern portion of the Province not elsewhere enumerated, south of latitude 46 deg.)

W. T. MACOUN, HORTICULTURIST, CENTRAL EXPERIMENTAL FARM, OTTAWA.

Orel 25, Vladimir, Minnesota, Ostheim, Cerise d'Ostheim.

ALGOMA DISTRICT.

(Including the islands of Manitoulin and St. Joseph, and a limited portion of the northern and eastern shore of the Georgian Bay.)

CHAS. YOUNG, RICHARD'S LANDING.

If near the influence of the water, Richmond, Montmorency, English Morello, Orel 25 and Ostheim.

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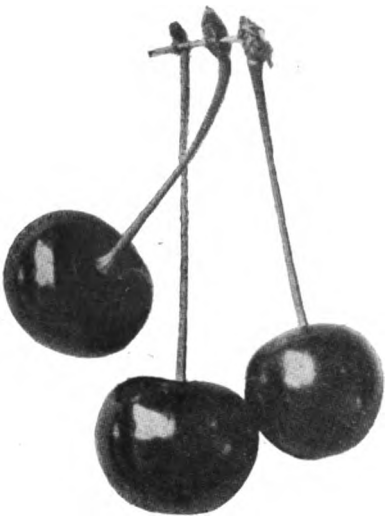
DESCRIPTION OF VARIETIES.

CHOISY. (*Belle de Choisy, Ambree grosse of Lelloy.*)

The most delicious of all dessert cherries, and one that should be planted in every amateur's garden; but of no value in the commercial cherry orchard, because not productive, and the tree is often short lived.



CHOISY.

ORIGIN: Choisy, near Paris, 1760.

TREE: Upright; foliage dark; hardy; not very productive; group, Duke.

FRUIT: Medium to large, ¾ × ¾, obtuse heart-shaped; skin transparent, showing the structure of the flesh and the cells of juice within; color bright cornelian red in sun, pale red to amber in shade; stem slender, two inches long; suture marked by a delicate line.

FLESH: Very pale red; texture soft, juicy; flavor sweet, very delicious.

QUALITY: Dessert very good.

VALUE: Market second class.

SEASON: Late June.

ADAPTATION: Southern Ontario

CLEVELAND.

One of the finest Bigarreau cherries for dessert purposes, being of high quality and not too firm in texture. A good variety for commercial orchards, because of its high color and earliness of season, but not yet fully tested in this Province.

ORIGIN: By Prof. Kirtland, Cleveland, Ohio.

TREE: Vigorous; of stout spreading habit; productive, fruited after three years planting at Maplehurst; group, Heart.

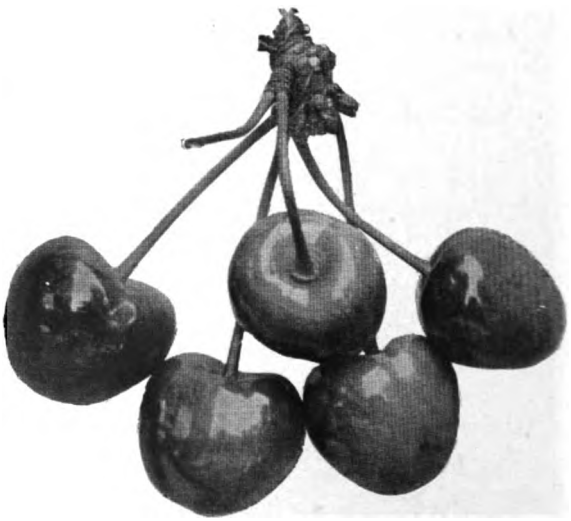
FRUIT: Large, ⅞ × 15-16 of an inch; form heart-shaped, sides unequal; color bright red maroon, on yellowish ground, dark rich red in the sun; stem stout, 1½ inches long in a broad, uneven cavity; suture broad, half way round.

FLESH: Light cream in color; texture almost tender, juicy; flavor sweet, rich and delicious.

QUALITY: First-class for table.

VALUE: Home market good; distant market good.

SEASON: Late June.



CLEVELAND.

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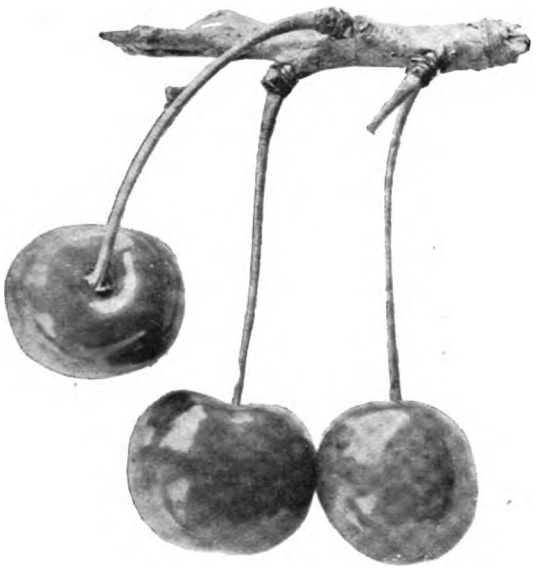
COE. (*Coe's Transparent.*)

A good variety for the home garden, but altogether too tender to be popular for the commercial orchard.



COE.

ORIGIN: In Connecticut, with Curtis Coe, of Middleton.

TREE: Healthy, fairly vigorous, with round spreading head, third rate in productiveness; group, Heart.

FRUIT: Medium to large; round and regular in form; skin thin, bright shiny amber, nearly covered with rich cornelian, marked with peculiar mottled blotches; stalk one and a half to two inches long, set in a medium wide cavity; suture obscure.

FLESH: Very pale yellowish tint; texture very soft and tender, juicy; flavor very good, if not left hanging too long.

QUALITY: Good for dessert.

VALUE: Second class for home market; fourth class for distant market.

SEASON: Early July.

ADAPTATION: South of Lake Ontario.

DYEHOUSE.

An early Morello cherry, ripening just in advance of Early Richmond, to which it is quite similar.

ORIGIN: Central Kentucky; an accidental seedling in the orchard of Mr. Dyehouse.

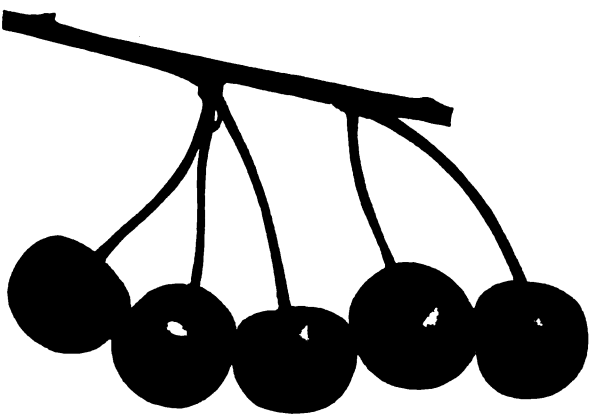
TREE: An early and abundant bearer; habit round, spreading head, slender; fairly vigorous; not as hardy as Richmond; class, Kentish.

FRUIT: Medium size, 9-16 × 11-16 of an inch; roundish oblate; apex depressed; stem, half an inch long, rather stout, set in a large cavity; color, light red.

FLESH: Pale yellow; fairly firm; flavor acid.

QUALITY: Dessert, poor; cooking, first class.

SEASON: Early July.



DYEHOUSE.

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DOWNER. (*Downer's Late.*)

A delicious dessert cherry.

ORIGIN: Massachusetts.

TREE: A vigorous, upright grower; fairly productive; group, Heart.

FRUIT: Size, large, $\frac{7}{8} \times \frac{7}{8}$; form, heart-shaped; stem, 1¼ to 1½ inches long; apex a slight depression; color, bright shiny red, marbled.

FLESH: Creamy white; texture tender, melting; flavor rich and sweet.

QUALITY: Very good for dessert; fair for cooking.

VALUE: Market, second class.

SEASON: Mid July.

EAGLE. (*Black Eagle.*)

A very excellent dessert cherry, well deserving a place in the home garden, but not sufficiently productive to be recommended for the commercial orchard. The average annual yield of large trees at Maplehurst is from twenty-five to thirty quarts. The fruit is usually in scattered clusters, and often borne singly, making the gathering expensive. In England, this variety is more productive than in Canada.

ORIGIN: England, 1810, by Miss E. Knight, of Downton Castle, from Biggareau and May Duke.

TREE: Second rate in vigor, of a round spreading habit; third rate in productiveness; group, Bigarreau.

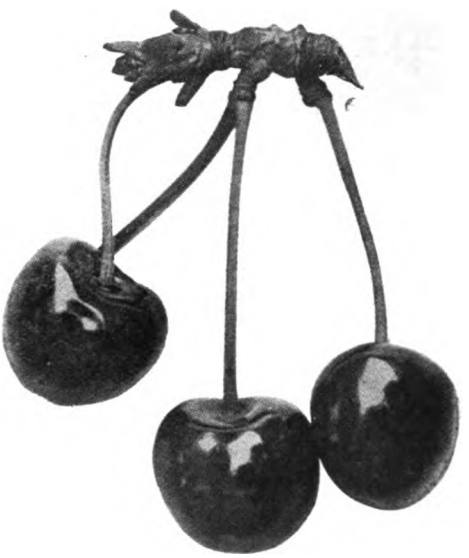
FRUIT: Medium to large, averaging about 13-16 long by 15-16 of an inch wide; form, obtuse heart-shaped, almost roundish oblate; skin dark red, becoming almost black; stalk slender, 1½ to 1¾ inches long in a medium cavity; stone, small.

FLESH: Dark purple; texture tender and juicy; flavor very sweet, rich and delicious.

QUALITY: Very good for dessert.

VALUE: First class for near markets; second rate for distant markets, because it soon decays.

SEASON: Mid July.



BLACK EAGLE (Reduced).

EARLY PURPLE. (*Early Purple Guigne.*)

The earliest cherry is the Early Purple, a foreign variety known in France as the Early Purple Guigne. The tree is a vigorous, upright grower, and becomes quite productive as it acquires age. Frequently the birds destroy the fruit before it matures, and if gathered as soon as colored red, it is little more than "skin and bones." The last few days of growth, the fruit fills out wonderfully, and then becomes almost a so-called "black cherry." Not usually profitable.

TREE: Upright, vigorous, healthy; productive when full grown.

FRUIT: Medium size; roundish heart-shaped; skin, dark red to purple; stem, two inches long in a shallow cavity; suture obscure.

FLESH: Red to purple; texture, tender, juicy; flavor, sweet and pleasant.

QUALITY: Dessert, good.

VALUE: Market, second class.

SEASON: Mid June.

ADAPTATION: Grown at Maplehurst for thirty years and quite hardy; recommended for trial north of Lake Ontario.

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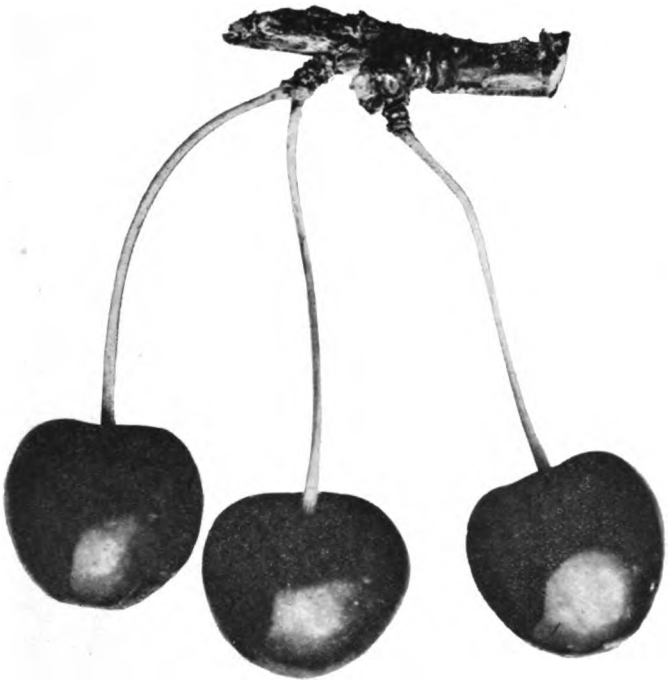
ELKHORN.



ELKHORN.

ORIGIN: Unknown.

TREE: Upright, long-jointed; growth, vigorous.

FRUIT: Heart-shaped, very large, black, solid, firm, productive; very good for dessert and market.

SEASON: Late July, before Windsor.

ELTON.

An excellent dessert cherry for the garden, but too soft and too much inclined to rot, to be worthy of a place in the commercial orchard.

ORIGIN: England.

TREE: A vigorous grower; upright in habit; quite productive.

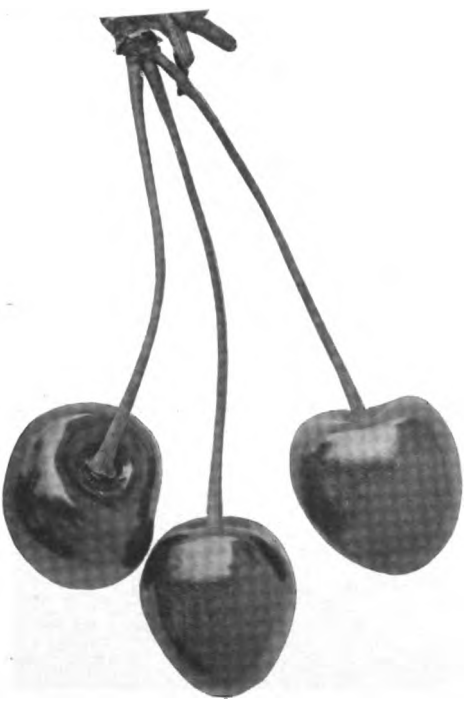
FRUIT: Medium to large; color, pale yellow, with red blush; stem, two inches long, set in a deep cavity.

FLESH: Light yellow; texture delicate, tender, moderately juicy; flavor, sweet, vinous, delicious.

QUALITY: Dessert, good; cooking, fair.

VALUE: Fair, but like most white cherries, not popular in the market, because inclined to show the slightest bruises.

SEASON: Early July.



ELTON.

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GRENNER GLAS.

TREE: Upright; fruit in clusters; vigorous; moderately productive.

FRUIT: Large in size, ⅞ × ⅞; form, oblate, one-sided; color, bright red; cavity, broad, shallow; stem, 1¼ inches in length; apex is a small depression; suture, traceable on one side.

FLESH: Color, yellowish, with colorless juice; texture, tender; very juicy; flavor, tart.

QUALITY: Dessert, poor; cooking, very good.

VALUE: Market, first class.

SEASON: Mid July.

HORTENSE. (*Reine Hortense.*)

One of the finest flavored of cooking cherries, and one which deserves the first place in the home garden. It is not as productive as the May Duke, but from its habit of fruiting singly is less subject to rot than that excellent variety.

ORIGIN: France, in 1832, by M. Larose, Neuilly; first fruited in 1838.

TREE: Of somewhat spreading habit, a vigorous and handsome grower and fairly productive; group, Duke.

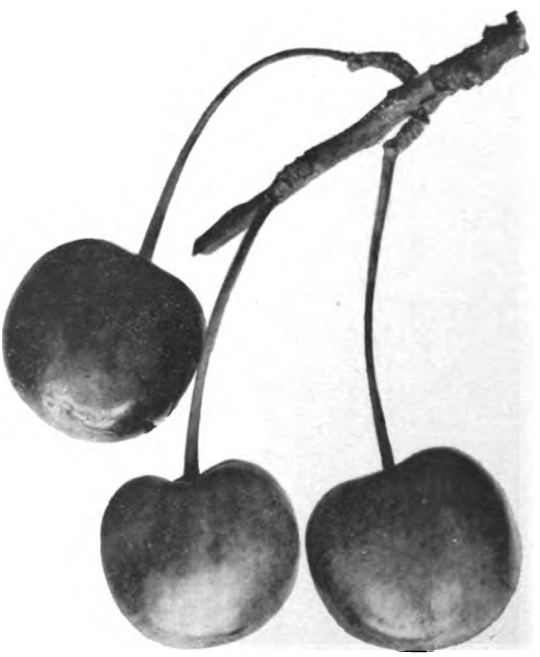
FRUIT: Very large; roundish elongated; side slightly compressed; skin, thin, light shining red mottled with darker red, becoming richer in color the longer it hangs; stalk, slender, about two inches long.

FLESH: Creamy yellow; texture netted, very tender, juicy; flavor, slightly subacid, excellent.

QUALITY: Very good for cooking; very good for dessert.

VALUE: First to second class for market.

SEASON: Mid July.



HORTENSE.

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KNIGHT. (*Knight's Early Black.*)

A delicious early, black cherry, ripening about a week in advance of Black Tartarian. It is a regular and even bearer. The fruit is borne singly, or, occasionally, in pairs, and, therefore, is not gathered as rapidly as those varieties which grow in clusters. It is one of the most valuable dessert cherries, but not so productive as the Tartarian.

ORIGIN: England, by T. A. Knight, in 1810, from Bigarreau, crossed with May Duke.

TREE: Healthy, fairly vigorous, with spreading head; second rate in productiveness; group, Heart.

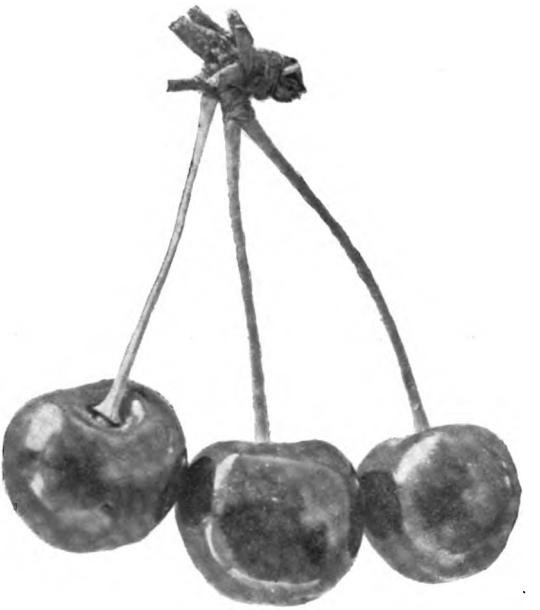
FRUIT: Medium to large; form, obtuse, heart-shaped, uneven; skin, dark red or purple, becoming almost black, if allowed to hang; stalk, two inches long in a rather large cavity.

FLESH: Dark red to purple; texture, tender and juicy, but firmer than Tartarian; flavor, sweet, rich and delicious; stone, small.

QUALITY: Very good for all purposes.

VALUE: For market, first class.

SEASON: Late June.



KNIGHT.

KOSLOV. (*Koslov Morello.*)

A valuable dwarf growing cherry of the Morello class, which is extremely hardy, and promises to be of the greatest value in the cold sections of Ontario.

ORIGIN: Fifty trees of this variety were imported from Jaroslav Niemetz, of Winnitza Podolie, Russia, in 1889, by Mr. Linus Woolverton, then Secretary of the Ontario Fruit Growers' Association, and by him distributed among the directors, and a few sent to Dr. Wm. Saunders, of the Central Experimental Farm, Ottawa.

TREE: Habit, bush form, very slow of growth, might be planted six feet apart in a field and cultivated two ways; very hardy, Niemetz says it has endured a temperature of 46 degrees below zero in Russia; very productive.

FRUIT: Fairly large; form, roundish; color, dark red, turning black at maturity; stalk, one and a half inches long, set in a slight depression; suture, traceable.

FLESH: Red, turning dark red at maturity; texture, tender, juicy; flavor, mild acid.

QUALITY: Cooking, good.

VALUE: Almost first class.

SEASON: Early August.

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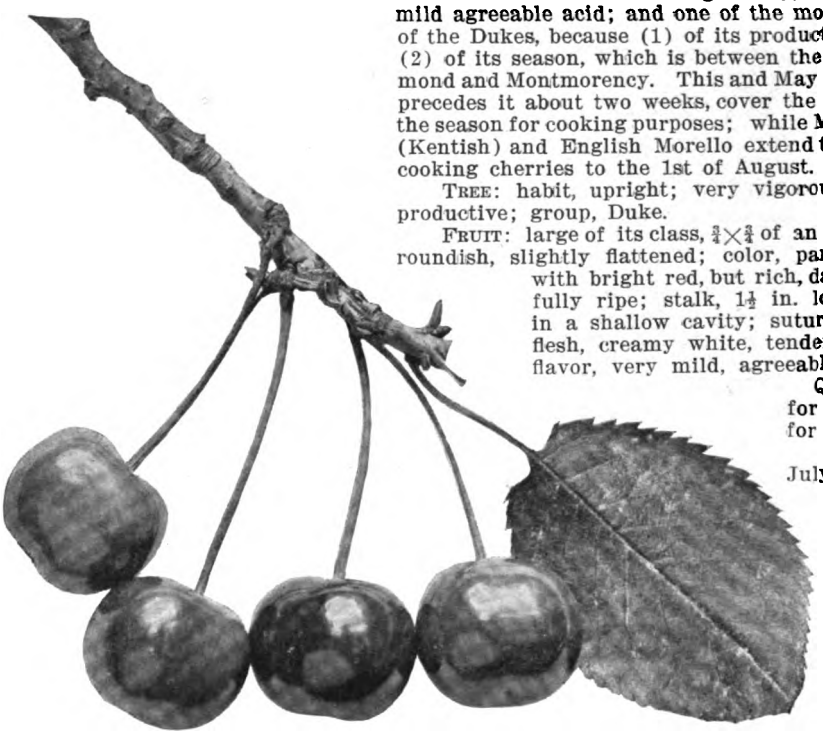
LATE DUKE. (*Anglaise Tardive.*)



A most desirable cooking cherry, because of its mild agreeable acid; and one of the most profitable of the Dukes, because (1) of its productiveness, and (2) of its season, which is between the Early Richmond and Montmorency. This and May Duke, which precedes it about two weeks, cover the early part of the season for cooking purposes; while Montmorency (Kentish) and English Morello extend the season of cooking cherries to the 1st of August.

TREE: habit, upright; very vigorous and very productive; group, Duke.

FRUIT: large of its class, ¾×¾ of an inch; form, roundish, slightly flattened; color, partly covered with bright red, but rich, dark red when fully ripe; stalk, 1½ in. long, inserted in a shallow cavity; suture, traceable; flesh, creamy white, tender and juicy; flavor, very mild, agreeable acid.

QUALITY: good for dessert; best for cooking.

SEASON: mid July.

LATE DUKE.

MAGNIFIQUE. (*Belle Magnifique.*)

Chiefly valuable for its lateness of ripening.

ORIGIN: France.

TREE: upright, round habit; vigor moderate; not very productive; Duke.

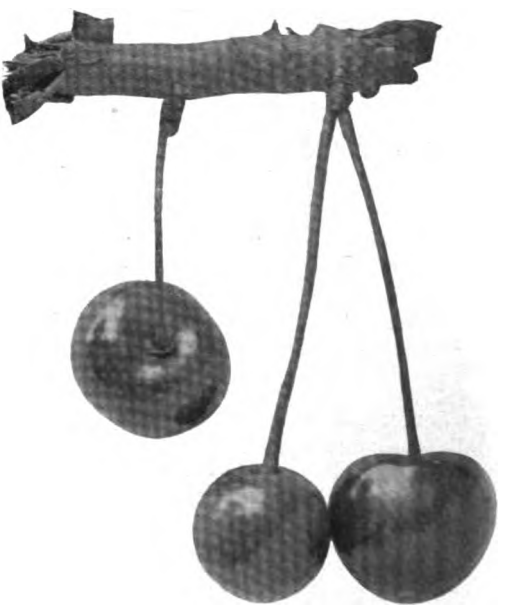
FRUIT: about ¾ of an inch long by ⅞ broad; form, heart shape, flattened, obtuse; color, bright red; stem, about two inches long, set in a large, broad cavity; suture, traceable.

FLESH: color, light yellow; juice, uncolored; texture, slender, juicy; flavor, subacid.

QUALITY: dessert, poor; cooking, good.

VALUE: market, second class.

SEASON: late July.



MAGNIFIQUE.

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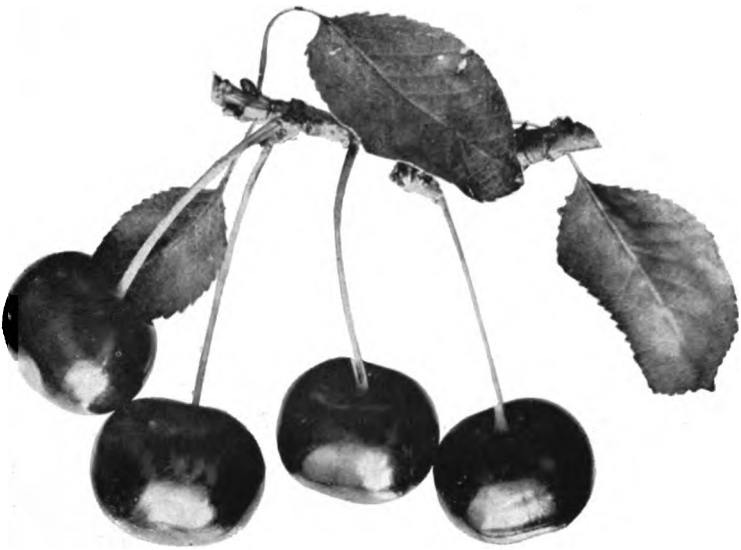
MAY DUKE. (*Early Duke, Royal Hative.*)

A fine cooking cherry. The great productiveness, health and vigor of the tree, the mild acid of the fruit ripening over a considerable season, all tend to make this a favorite variety. The fruit is rather tender for distant shipments, and inclined to rot in wet seasons. These Duke cherries have green and ripe fruit at the same time, which makes them undesirable for commercial orcharding, as it necessitates several pickings instead of one, increasing the cost of harvest beyond the margin of profit.



MAY DUKE.

ORIGIN: Medoc, a Province in France, from whence the name is said to be a corruption.

TREE: upright, a habit especially noticeable in young trees; vigorous, hardy and productive; group, Duke.

FRUIT: size, small to medium; form, roundish, obtuse, heart-shaped, with traceable suture and distinct indentation to apex; grows in clusters; skin, bright red, turning darker at full maturity; stalk, 1½ to 2 inches long; stone, small.

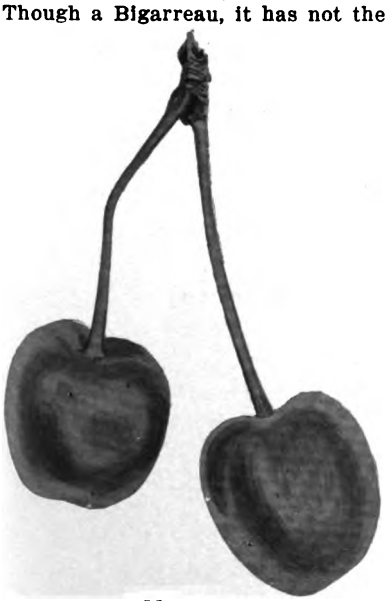
FLESH: red; texture, tender, very juicy; flavor, subacid, and very good.

QUALITY: good for dessert, first class for cooking.

SEASON: late June.

MEZEL. (*Monstreuse de Mezel, Bigarreau of Mezel.*)

One of the finest of the late black cherries, of large size and great productiveness. Though a Bigarreau, it has not the fault of its class of being especially subject to rot: it is not so black in color as the Elkhorn, but dark enough a red to be classed with the black cherries.



MEZEL.

ORIGIN: Mezel, France; first introduced in 1846.

TREE: upright, spreading, a very vigorous grower; one tree at Maplehurst, forty years planted, was thirty feet in height in 1897, and covered an area about the same number of feet in diameter; first rate in hardiness and in productiveness; group, Bigarreau.

FRUIT: very large, fifteen-sixteenths of an inch long by one inch in width; form, obtuse, heart shaped, slightly flattened, with a clearly-defined suture on one side, ending in a slight nipple; skin, dark red at first, changing to dark purple at maturity; stalk, two inches long, slender, set in good-sized cavity.

FLESH: firm, juicy, breaking; flavor, sweet, good.

QUALITY: for dessert, very good.

VALUE: for market, first class.

SEASON: mid July.

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MORELLO. (*English Morello.*)

An old reliable variety for cooking purposes, known in England for nearly three hundred years, and deserving of wider cultivation in Ontario. Downing thinks the name Morello is from *Morus*, the Mulberry, from the dark purple color of its juice, which resembles that of the mulberry; a profitable market variety.

TREE: habit, spreading, slender, hardy and very productive; vigor, medium; group, Morello.

FRUIT: fairly large, roundish, nearly heart shaped, somewhat flattened on one side, with a slightly traceable suture.

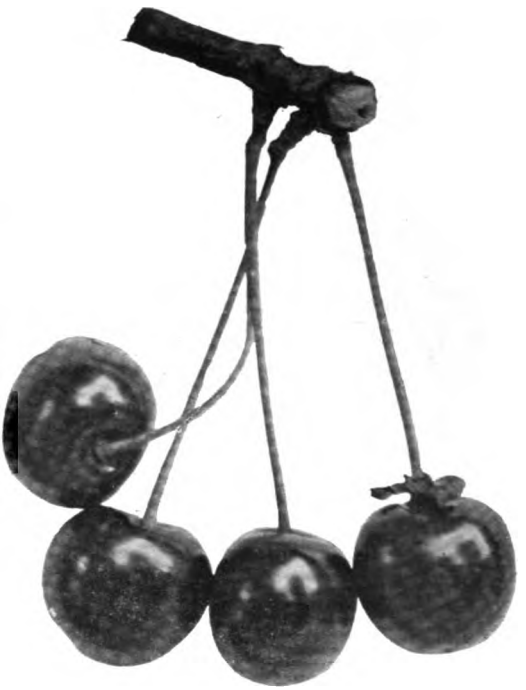
SKIN: red, turning dark red or purple towards maturity; stalk, about 1¼ inches long, inserted in a shallow cavity; stone, small, slightly cling.

FLESH: very dark red; texture, tender, juicy; flavor, acid, becoming more sub-acid and agreeable the more it matures.

QUALITY: dessert, very poor, cooking, first-class.

VALUE: home market, first class.

SEASON: early August.



MORELLO.

NAPOLEON. (*Napoleon Bigarreau, Royal Anne of California.*)

A valuable variety of foreign origin. Perhaps the most productive variety known, yielding fruit of the very largest size which is in good demand, and, therefore, one of the most desirable for the commercial orchard. It has one serious fault, namely, it is very subject to the rot, especially in wet seasons, and sometimes the whole crop of this variety is ruined by it.

TREE: upright, spreading, vigorous, hardy on the south shore of Lake Ontario; very productive.

FRUIT: very large, oblong heart shaped; skin, yellow ground, light in shade, rich red cheek in the sun, sometimes mottled; stem, 1¼ inches long; suture plainly traceable.

FLESH: yellowish white, very firm, meaty, fairly juicy; flavor, good; texture much esteemed for canning because it looks well in the jars and bears cooking well.

QUALITY: dessert, medium.

VALUE: market first class.

SEASON: early July.

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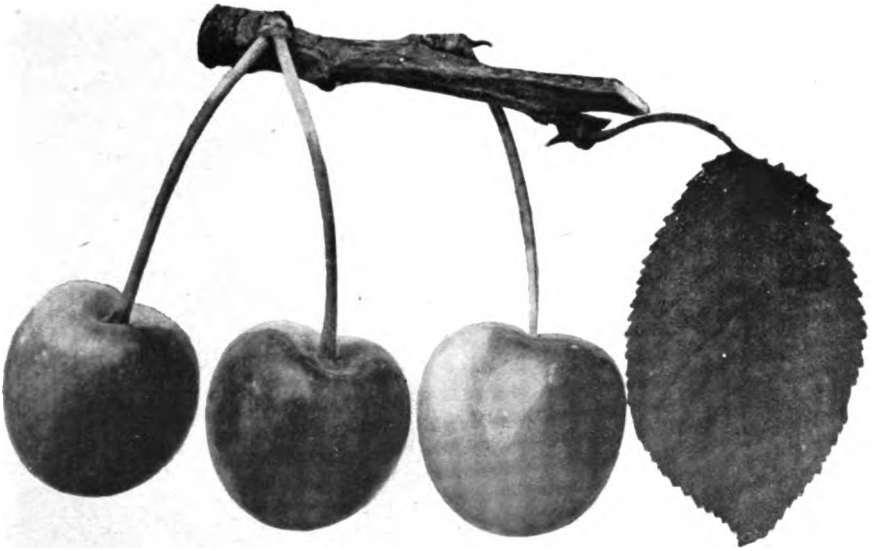


NAPOLEON.

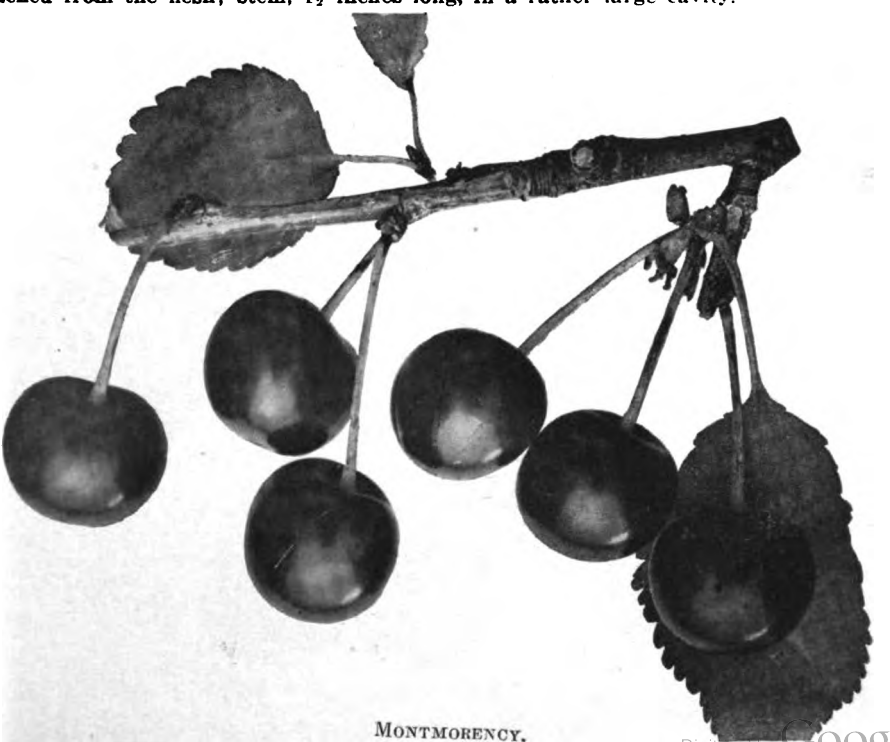
MONTMORENCY.

Of all the Morello cherries, this seems to us the most profitable. The tree is one of the most vigorous in its class, the fruit being large and abundant. This and the Early Richmond cover the season very well, and are the two leading Kentish varieties for market. In France, this cherry has many synonyms, as, for example, Montmorency, a longue queue, Petit-Gobet, etc.

ORIGIN: Montmorency valley, in France, in middle of 17th century.

TREE: hardy, healthy, fairly vigorous, very productive and an early bearer.

FRUIT: attached in ones and twos; size, ¾ long by ⅞ inch broad; form, roundish, almost flattened at apex; skin, bright, shiny red, becoming darker at maturity, easily detached from the flesh; stem, 1½ inches long, in a rather large cavity.



MONTMORENCY.

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FLESH: pinkish yellow, tender, very juicy, sprightly acid.
QUALITY: very good for cooking.
VALUE: for market, first class.
SEASON: mid July.
ADAPTATION: general over the Province.

OREL 25.

One of the hardiest of the Morello cherries; reported upon favorably by the northern stations, and considered by Mr. Jones, of the St. Lawrence station, the best all round cherry yet tested for cold sections.

ORIGIN: Russia; imported by Prof. Budd in 1883.

TREE: rather a slow grower; an early and abundant bearer; habit, round spreading head.

FRUIT: medium size, $\frac{8}{8} \times \frac{7}{8}$ of an inch; form, roundish; color, carmine; stem, $1\frac{1}{4}$ to $1\frac{1}{2}$ inches, in a round cavity; apex, a distinct depression; suture, partly traceable.

FLESH: color, yellowish; texture, tender, juicy; juice, uncolored; flavor, mild subacid.

QUALITY: dessert, poor; cooking, good.

VALUE: market, first class.

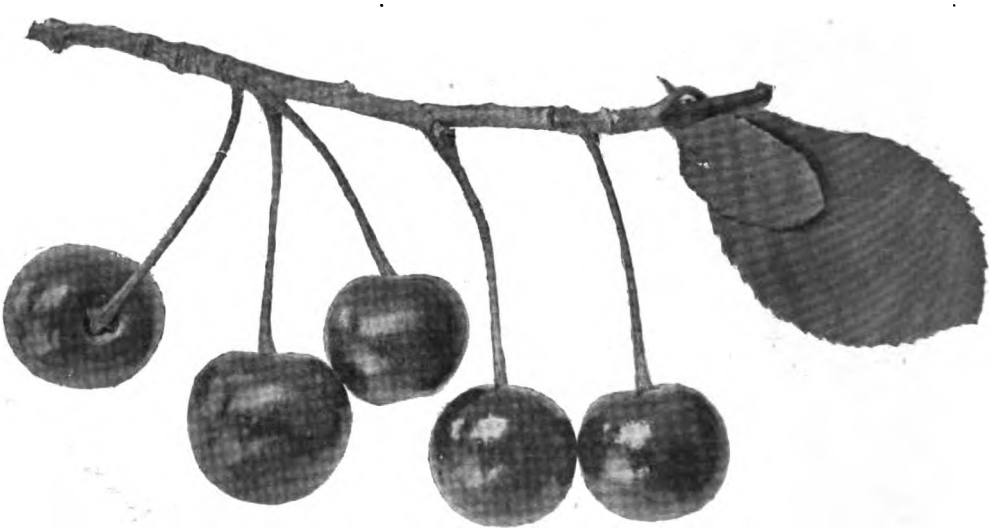
SEASON: mid July.

ADAPTATION: one of the hardiest varieties.

OREL.

OSTHEIM. (*Griotte d'Osthcim.*)

This Morello cherry was distributed throughout the Province by the Ontario Fruit Growers' Association. The fruit is of fair size, productive enough to be profitable, and good for all purposes. Its hardiness should make it a special favorite in the colder sections to succeed the Montmorency.



OSTHEIM.

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ORIGIN: South of Spain, brought to Germany early in the 18th Century, and cultivated near Ostheim, Saxe-Weimar, whence its name.

TREE: third rate in vigor, almost a dwarf; first in hardiness, and second rate in productiveness; group, Morello.

FRUIT: medium, about 9-10 × 13-16 in. in length and breadth. The variety must vary, since Dr. Hogg describes it as large, and LeRoy describes the stalk 2 inches long, set in a pronounced cavity; form, round, slightly depressed at the side; color, very dark purple, almost black when ripe; stalk, 1⅛ inches; suture, not traceable; pit, small, cling.

FLESH: color, very dark purple; texture, tender, juicy, almost sweet when ripe, agreeable.

QUALITY: poor for dessert, fair for cooking.

VALUE: for market, third class.

SEASON: late July.

ADAPTATION: quite general; found fruiting freely on St. Joseph's Island, Algoma.

OLIVET.

From tests in the experimental orchard, we judge the Olivet to be a valuable variety for the home garden. The tree is a fine grower, and the fruit large and attractive, with a mild acid flavor, while in season it immediately succeeds the Reine Hortense.

TREE: of French origin, usually classed with the Dukes, fairly vigorous; hardy; productiveness, second rate.

FRUIT: large, ¾ by ⅞, obtuse, heart shaped, almost round; color, dark rich carmine; stem, 1 to 1¼ inches long in a broad cavity, often in pairs.

FLESH: reddish; texture, soft, melting, very juicy; juice, stains red; flavor, very mild. pleasant acid.

QUALITY: dessert, fair; cooking, very good to first class.

VALUE: not yet determined in Ontario.

SEASON: early July.

OHIO. (*Ohio Beauty.*)

A sweet cherry, succeeding Wood; not subject to rot.

ORIGIN: Ohio.

TREE: habit, upright; vigorous producer; class, Heart.

FRUIT: size, large, 12-16 by 13-16; form, heartshaped; stalk, one and a half inches long, slender, in a moderately deep, somewhat irregular cavity; color, light yellow, nearly overspread with light and dark shades of bright red.

FLESH: color, yellowish white; texture, tender, meaty, somewhat juicy; flavor, sweet, very pleasant.

QUALITY: dessert, very good; cooking, fair.

VALUE: market, second class, compared with black oxhearts.

SEASON: early to mid July.

PURITY.

A remarkably fine Morello cherry, ripening slightly in advance of the Early Richmond, and very productive. It closely resembles Dyehouse.

TREE: fairly vigorous, healthy and productive; an early bearer.

FRUIT: size, fair, ⅞ × ¾ of an inch; form, roundish; color, very dark red; stem long, 1½ to 2 inches, set in a deep cavity; apex, much depressed; pit, small.

FLESH: color, yellowish; texture, tender; very juicy; flavor, subacid, pleasant.

QUALITY: dessert, fair; cooking, very good to best.

VALUE: market, first class.

SEASON: late June to early July.

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PLYMOUTH. (*Plymouth Rock.*)

A valuable white Bigarreau, because not subject to rot, and a fine shipper.

ORIGIN: Connecticut.

TREE: vigorous; very productive; an early bearer.

FRUIT: medium, ¾ × ¾ of an inch; heart shaped; color, bright red in sun on yellowish ground; stem, 1⅛ inches long in a one-sided cavity.

FLESH: yellow; texture, tender, meaty, moderately juicy; flavor, sweet, rich, excellent.

QUALITY: very good for dessert.

VALUE: market, second class.

SEASON: mid July.

RICHMOND. (*Early Richmond.*)

(*Virginian May; Kentish Pie of Hogg; Hative of LeRoy.*)

This Morello cherry appears to be of French origin, and George Lindley supposed that it had been brought into England from Flanders in the reign of Henry III.

TREE: slow grower, slender in branch; very hardy; very productive in proportion to its size.

RICHMOND.

FRUIT: Below medium, free from rot and not very subject to curculio; form, almost round, though slightly flattened; skin, uniformly of a bright red, becoming darker as it matures; stem slender, about one inch in length, often carrying the calyx, inserted in a good-sized cavity; apex, set in a small indentation.

FLESH: very tender in texture; yellowish with abundant uncolored juice; flavor quite acid; pit small.

QUALITY: poor for dessert, but first class for all culinary purposes.

VALUE: very good for market.

SEASON: early to mid July.

ADAPTATION: succeeds wherever cherries are grown in the Province.

ROCKPORT.

A Bigarreau originated by Prof. Kirtland, of Cleveland, Ohio. Its season of ripening is about the same as Governor Wood, but it is a heavier bearer of fruit, about the same size and less highly colored. It would be profitable were it not so subject to rot, but nearly every year we have lost a large portion of the crop of this variety at Maplehurst from this cause. Like the other Bigarreaus, it is too firm a cherry to be a favorite with the birds.

TREE: upright, spreading; fairly vigorous; very productive.

FRUIT: large, roundish, obtuse, heart-shaped; skin, amber, nearly covered with bright red.

FLESH: pale yellow; texture, firm, juicy; flavor, sweet and good.

QUALITY: dessert or cooking good.

VALUE: market, second class.

SEASON: late June

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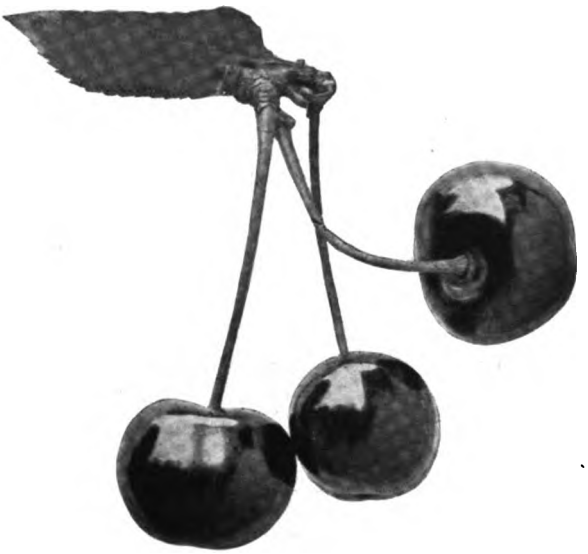
ROYAL DUKE.

A fine pie cherry, but it ripens unevenly, and is inferior to the Late Duke, both in quality and productiveness.

ORIGIN: France.

TREE: very upright; vigorous; fairly productive; Duke.

FRUIT: medium size, half by three-quarters of an inch in diameter; form, roundish, heart shape: color, light red, crimson on sunny side; stem one and a half inches long, set in a round, regular cavity; apex, a dimple.



ROYAL DUKE.

FLESH: flesh color; texture, moderately firm, juicy; flavor, subacid.

QUALITY: cooking, good.

VALUE: market, first class.

SEASON: early July.

RUSSIAN MORELLO. (*Russian 207.*)

A good cooking cherry.

ORIGIN: Russia.

TREE: vigorous; productive.

FRUIT: small, ½ inch long by ⅝ wide; roundish in form; color, dark red; stem, 2 inches long, in a shallow cavity.

FLESH: color, red, with colored juice; texture, tender, moderately juicy, semi-cling; flavor, ordinary.

QUALITY: dessert, useless; cooking, good.

VALUE: market, second class.

SEASON: mid July.

SCHMIDTZ. (*Schmidtz' Bigarreau.*)

A magnificent cherry, but so far not sufficiently productive.

TREE: upright; very vigorous; not very productive; group, Bigarreau.

FRUIT: very large; form, obtuse, heart shaped; color, dull red, mottled with rich red; stem, 1¼ inches long in a large cavity; suture, slight.

FLESH: color, reddish; texture, firm, moderately juicy, flavor, sweet and rich.

QUALITY: first class for dessert.

VALUE: market, first class.

SEASON: late July.

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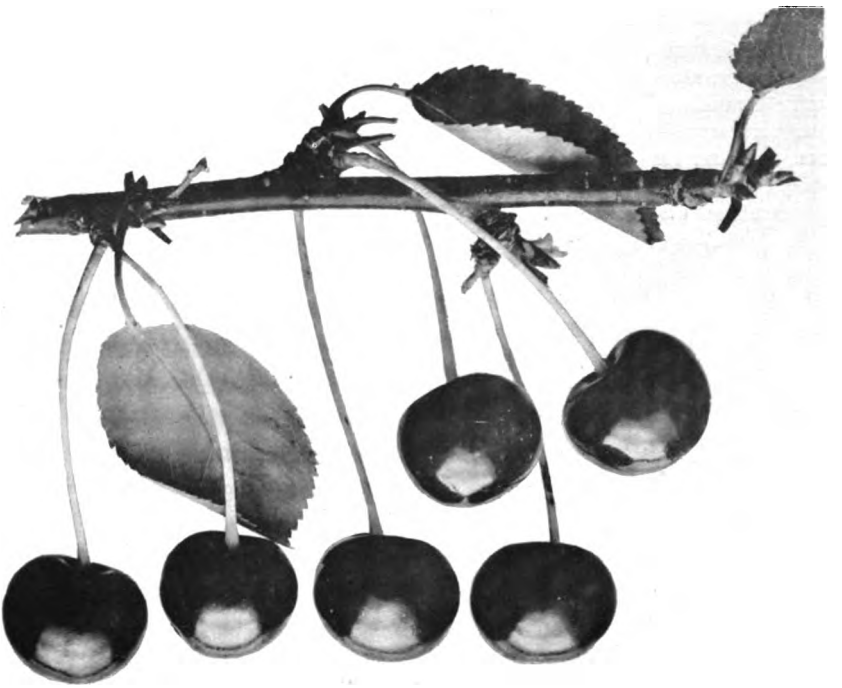
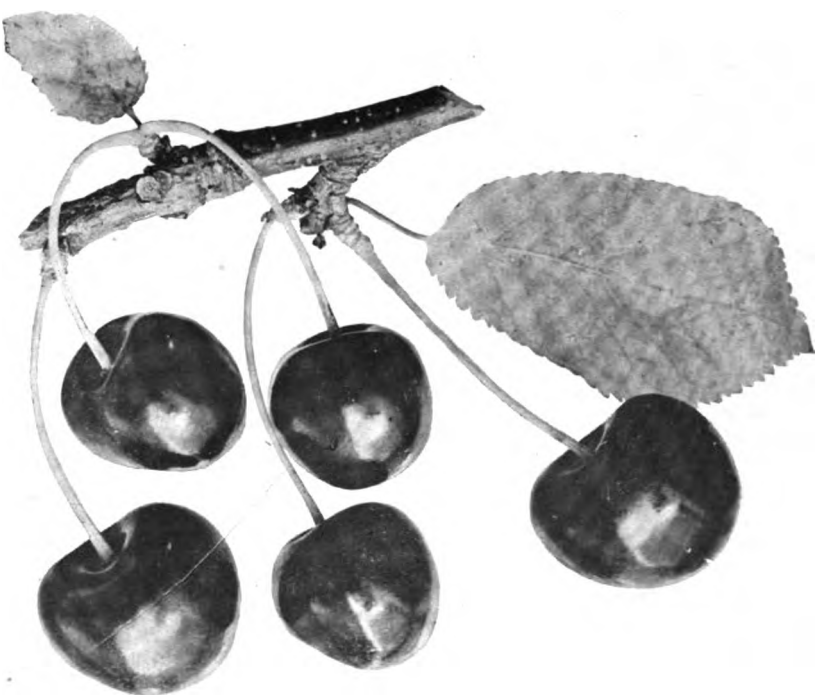


RUSSIAN MORELLO.



SCHMIDTZ.

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SPANISH. (*Yellow Spanish.*)

Of the Bigarreau cherries, this is one of the finest, both on account of its great size and its delicious flavor. The tree grows to a very large size, surpassing in this respect any other cultivated variety with which we are acquainted. It does not average very productive, because the fruit often blasts and drops, or is destroyed by Monilia. When, however, it does mature a good crop, the yield is enormous.

The variety is of European origin, and was introduced into the United States in 1800.

TREE: very vigorous, of large growth; habit, spreading, fairly productive.

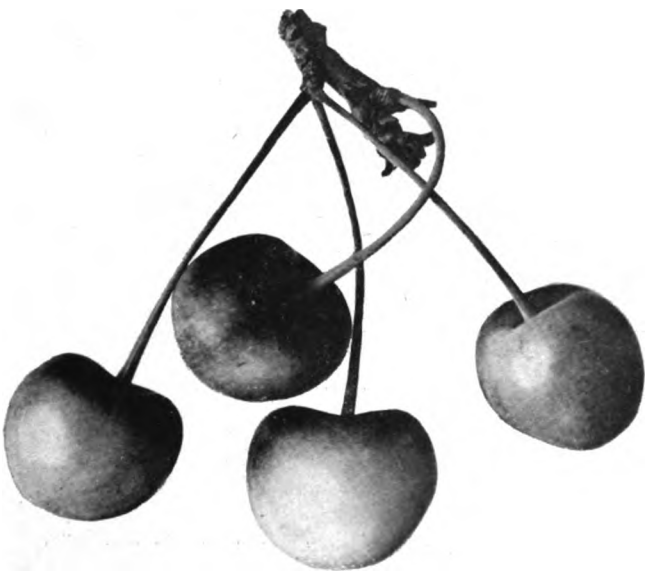
FRUIT: very large and of a beautiful waxy lustre; form, round, obtuse, heart-shaped; skin, clear amber, nearly covered with red when exposed to the sun; stem, stout, 1½ inches long, in a wide cavity; suture, traceable.

FLESH: pale yellow; texture, firm, juicy, breaking; flavor, sweet, delicious when well ripened.

QUALITY: dessert, very good; cooking or canning, very good.

SEASON: early July.

VALUE: market, first class.



SPANISH.

SUDA. (*Suda Hardy.*)

A fine Morello cherry, but of about the same season as the Montmorency and hardly as productive.

ORIGIN: Missouri.

TREE: habits, round head, Kentish; fairly vigorous, very hardy; productive.

FRUIT: size ⅞ of an inch in diameter; form, roundish, slightly flattened; color, red; stem, 1½ to 1¾ inches long, set in a regular cavity; apex, very slight; suture, barely traceable.

FLESH: yellowish white; texture, soft, tender, juicy; flavor, tart.

QUALITY: dessert useless; cooking very good.

VALUE: market almost first-class.

SEASON: mid July.

TARTARIAN. (*Black Tartarian.*)

Of black cherries this is one of the choicest, whether for market or for dessert on the home table. Of large size and delicious flavor, it is relished by all cherry lovers, and being somewhat soft-fleshed, it is very subject to the ravages of birds; it is also

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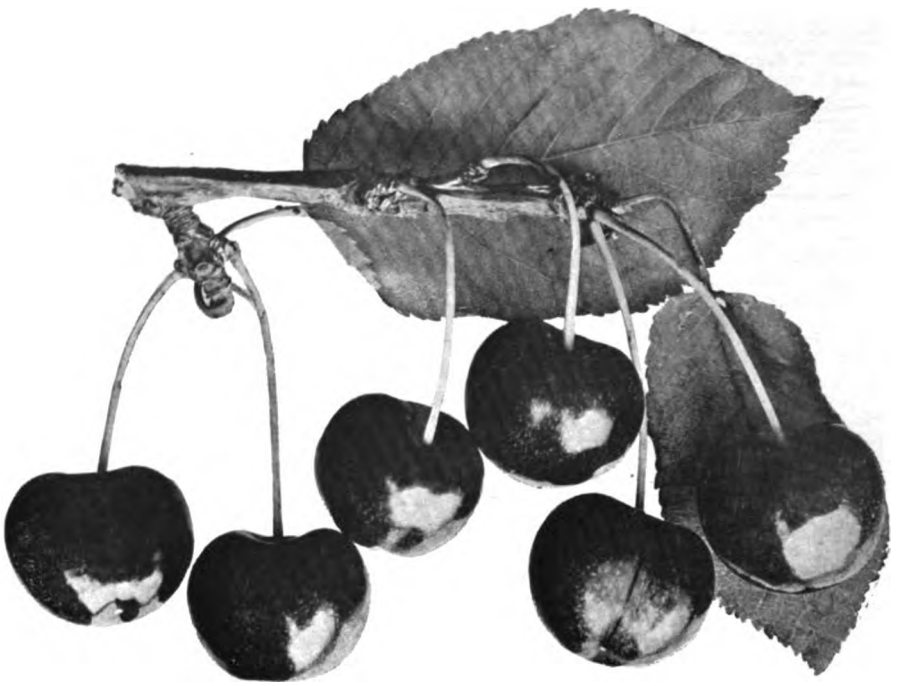
subject to rot in wet seasons. On this account it is often necessary to harvest and ship it a little on the green side. It is not so productive as some others, but it makes up for this by bringing a higher price.



TARTARIAN.

ORIGIN: Russia and Western Asia, introduced into England in 1796, and thence to America.

TREE: erect, vigorous, attaining large size; fairly productive; group, Heart.

FRUIT: very large, ¾ × 1 inch, heart-shaped, of somewhat irregular outline; stem, 1¼ inches long; skin, bright purplish black.

FLESH: dark purple, tender and juicy; flavor, rich and delicious.

QUALITY: dessert, very good.

VALUE: market, first class.

SEASON: early July.

ADAPTATION: south of Lake Ontario, and in sheltered places a little further north.

WINDSOR.

A valuable late cherry for either home use or market, its firm flesh making it a better shipper than most dark-colored cherries. Indeed, from the middle to the end of July, when this cherry is at its best, there is no other to compete with it, the Elkhorn being just over. The tree is not an early bearer, and the fruit is very subject to the rot in some locations and needs thorough spraying with Bordeaux to prevent this fungus.

ORIGIN: by James Dougall Windsor, Ontario.

TREE: a vigorous, upright, symmetrical grower, healthy, very hardy and productive.

FRUIT: large, 15-16 inch long by 1 inch wide; form, round, obtuse, heart shaped; color, dark red, turning darker as it hangs; stem, 1¼ inches long, set in a moderately deep cavity; in twos and threes; suture, obscure.

FLESH: yellowish, with reddish tint; texture, firm, moderately juicy; flavor, rich and sweet.

QUALITY: dessert, very good; cooking, poor.

VALUE: first class.

SEASON: late July.

ADAPTATION: farther north than most Bigarreau cherries.

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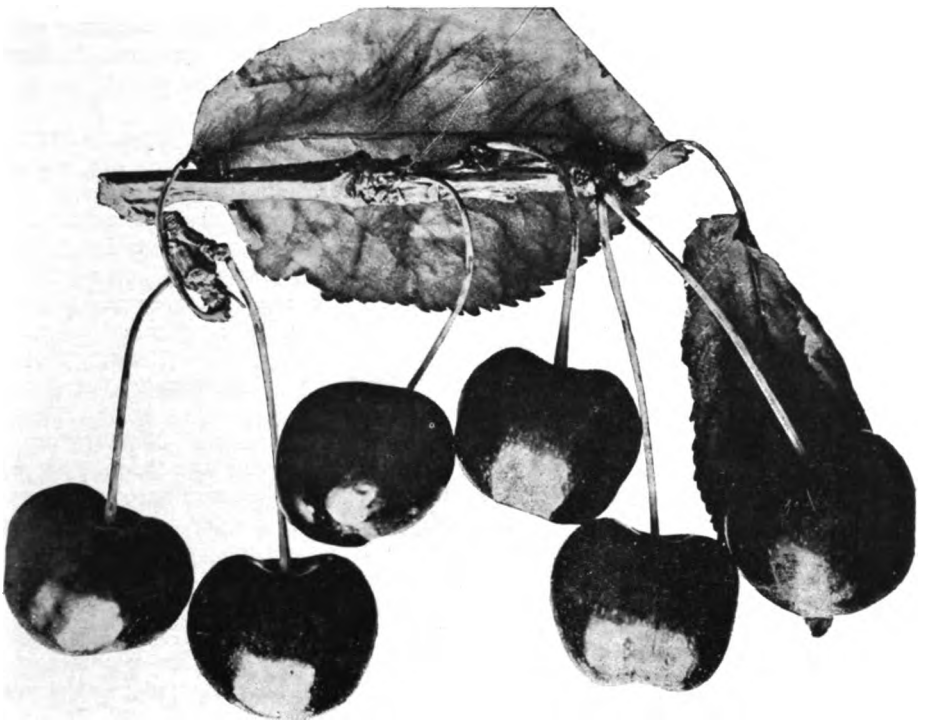


WINDSOR.

WOOD. (*Governor Wood.*)

This variety has proved itself a most satisfactory cherry for both dessert and market purposes. It is a very productive variety, and, though somewhat tender in flesh, is not nearly so subject to ravages by birds as Early Purple or Tartarian. Originated by Prof. Kirtland, of Cleveland, Ohio, U.S.A.

TREE: upright, spreading, healthy, vigorous and hardy wherever the peach succeeds.

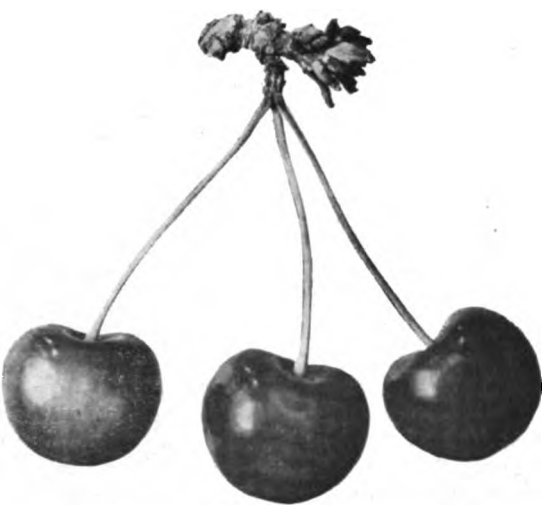
FRUIT: medium to large, ¾ to ⅞ of an inch in length and breadth respectively; form, roundish-heart-shaped; skin, light yellow, shaded with light to deep red; stem, 1½ to 1¾ inches long in a broad, deep cavity; suture, distinct on one side.

FLESH: yellowish; texture, tender, juicy; flavor, sweet, aromatic and delicious.

QUALITY: dessert, very good.

VALUE: market, first and second class.

SEASON: late June.



GOV. WOOD.

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THE PEACH

The peach is the tenderest of the large fruits grown in Ontario, and the fact that it can be grown so successfully in some parts of the Province has done much to dissipate the idea which at one time prevailed in the United States and abroad, that the climate of Ontario was too severe for anything but the hardiest fruits.

The district in Ontario where the peach succeeds best is the Niagara Peninsula, where Lake Ontario and Lake Erie do much to amlieorate the climate and prevent in a large measure the extremes in temperature which are fatal to peach culture. In the Essex Peninsula, or the extreme southwestern part of the Province, the peach also succeeds well, but has in the past been more subject to root-killing in winter. This may probably be guarded against in the future by the more general use of cover crops.

The peach also does fairly well where the soil is suitable all along the Lake Erie-Huron shores, the most favorable locations, however, being within four or five miles of the water. During recent years it has been found that the peach will thrive along the shore of Nottawasaga Bay, which is known as the Georgian Bay district, but up to the present time only a limited number of trees have been planted.

Peaches are raised for home use all over the western part of the Province with varying degrees of success, depending on the protection afforded and the soil, but where the temperature falls much more than 10 degrees Fahr. below zero success is very uncertain. Probably the extreme northern limit where peaches have been produced in the open is at Orillia, though the trees lived but a few years. They have been grown as far east as the city of Belleville, and perhaps further.

The market for the best peaches is good, and the peach where it can be grown successfully is one of the most profitable fruits.

As the peach is a tender fruit and the trees suffer when there are extremes of temperature, and at certain seasons when there are light frosts, great judgment should be shown in choosing a site for the orchard. Where possible, a site should be chosen with an exposure facing the water. If a northern exposure is available and the site is suitable in other ways it should be utilized, as often great injury is done by spring frosts when the buds are swelling, and buds will not expand as rapidly on a northern slope as on a southern. A site where local frosts are known to occur should be avoided.

While the situation for the peach orchard is important, a site will avail little if the soil is not suitable. The soil should be as near as possible a rich warm sandy loam with an open gravelly subsoil affording perfect drainage. Orchards are occasionally found thriving on heavier soils, but success is less certain on the heavier lands. The soil should be thoroughly prepared as recommended for the apple, and no fruit will respond better to thorough tillage than the peach.

Trees one year from the bud are the best kind to plant. They should be thrifty and free from insects and disease. The best time to plant is early in the spring, although fall planting is sometimes successful. Peach trees are planted twenty feet apart. When planting, some of the best growers remove all of the side branches, leaving a mere whip, while others cut the side branches back to within one or two buds of the main stem. The advantage gained by the latter method is that the tree is stronger at the crotches and not quite so liable to split down with weight of crop. Whatever plan is adopted, the tree should be pruned back severely when set. Peaches are usually headed lower than other large fruits, from 12 to 18 inches from the ground being the usual distance at which the head is started. For the first two or three years pruning should be carefully done in order to get a well-balanced top with four or five strong branches, avoiding bad crotches. In order to keep the tree within bounds, severe heading back is necessary until the trees come into full bearing, the usual practice being to head back from one-half to two-thirds of the previous year's growth every spring, at the same time removing altogether branches which will make the top too crowded. The object is to have a tree which will bear fruit all through the head instead of merely on the outside or at the top of the tree.

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The cultivation of peach orchards should be very thorough to produce vigorous growth, as the proportion of strong new growth which is made, regulates to a large extent the size of the crop, for peaches, unlike most other large fruits, are borne on the wood made the previous year.

Cover crops are very desirable in peach orchards, as the peach soils are usually deficient in humus which cover crops supply, and the latter protect the roots of the trees in winter, thus lessening the danger from root killing. As peach trees when in full bearing draw heavily on the potash in the soil, a good application of unleached ashes every two or three years is beneficial, and muriate of potash and bone meal applied at the rate of about 200 pounds per acre each, annually, should do much good, especially when barnyard manure cannot be obtained.

Where it can be managed, it usually pays well to thin peaches on the tree. This is done when they are about the size of small hickory nuts, the peaches being left from four to six and even eight inches apart on the branches.

It requires judgment to know just when to pick a peach, as much will depend upon the distance it is to be shipped. When intended for immediate consumption, no one is likely to pick a peach until it is ready to eat, but for a distant market it must be still firm, though well colored. Fruit which is picked on the green side never attains its full flavor, and, unfortunately, much fruit of this class reaches the market, and it undoubtedly lessens the consumption of this fine fruit. Bruising of peaches should be avoided, hence great care should be taken in handling them.

Varieties Recommended.

General List, approved by the Board of Control.

General List for Niagara District only.

St. John, Early Crawford, Greensboro, Champion, *Brigdon or Garfield, Fitzgerald, *Reeves, *Niagara, Elberta, Carmen, Beers Smock.

*Very similar, and any of these varieties may be set, but all are not needed to cover the season.

DISTRICT LISTS.

Niagara District

(Including the Niagara Peninsula from the Niagara River to Hamilton and north to the escarpment).

S. H. Rittenhouse, Jordan Harbour.

St. John, Early Crawford, Fitzgerald, Elberta, Lemon Free, Beers Smock.

J. W. Smith & Sons, Winona.

Triumph (5); Leamington (5); St. John (15); Early Crawford (10); New Prolific (10); Champion (5); Rareripe (10); Elberta (20); Late Crawford (5); Lemon Free (10); Beers Smock (5).

The figures refer to the percentage of each variety that this firm recommends for planting.

C. E. Fisher & Sons, Queenston.

Commercial: Sneed (White), Triumph, Carman (White), St. John, Fitzgerald, Jacques, Reeves, Niagara, Elberta, Late Crawford, Beers Smock.

Note.—The Triumph requires a rich, sandy loam, well fertilized every year with well-rotted compost manure, applied during early winter, and in spring just before plowing a heavy application of muriate of potash and pure bone. Proper pruning of tree and thinning of fruit are essential.

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ESSEX PENINSULA

(Including Essex, Kent and Pelee Island).

J. L. Hilborn, Leamington.

Dewey, St. John, New Prolific, Engle, Kalamazoo, Elberta, Banner, Golden Drop, Lemon Free.

J. Atkin & Son, Leamington.

Dewey, St. Johns, New Prolific, Champion, Kalamazoo, Engle, Banner, Late Crawford, Lemon Free, Smock, Salway.

FOREST DISTRICT

(Including the County of Lambton).

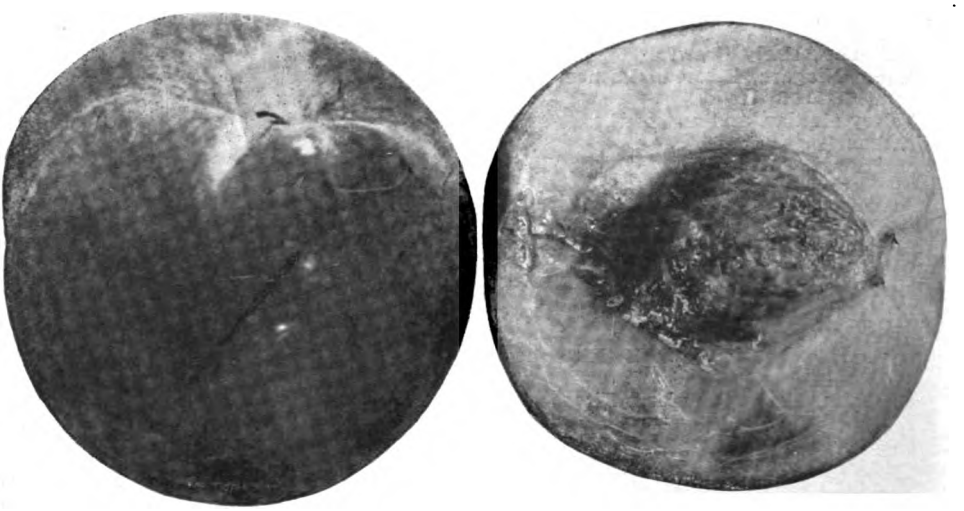
D. Johnson, Forest.

For those parts of the county influenced by the lake: St. John, Fitzgerald, Late Crawford, Engle, Kalamazoo, Elberta, Smock.

DESCRIPTION OF VARIETIES

ALEXANDER.

An early variety, grown in the Niagara district and in Essex County. It is a clingstone of poor quality for dessert purposes and poor also for cooking, so that, in competition with better varieties coming in at the same time from southern orchards, it sells at a low price in our markets.



ALEXANDER.

ORIGIN: chance seedling, Mount Pulaski, Ill., on farm of A. O. Alexander.
TREE: vigorous; hardy; productive.
FRUIT: medium; globular, sides unequal; color greenish, suffused with dark and light red; suture broad; apex slightly sunken.
FLESH: color, greenish white; texture, firm, juicy, half melting, clings to stone; flavor, sweet and fairly good.
QUALITY: dessert, poor; cooking, poor.
VALUE: market, second class.
SEASON: early August.

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BANNER.

A popular late market peach among the Essex fruit growers.

ORIGIN: Essex County, Ontario; first fruited on a large scale in 1903.

TREE: hardy and productive.

FRUIT: medium to large; round; color, yellow with red cheek; attractive.

FLESH: yellow; texture, fine grained, moderately juicy; flavor rich.

QUALITY: good.

VALUE: market, first class.

SEASON: early October.

BEERS SMOCK.

The best late peach for commercial planting.

ORIGIN: New Jersey.

TREE: vigorous, productive, hardy, spreading and somewhat droopy in habit of growth.

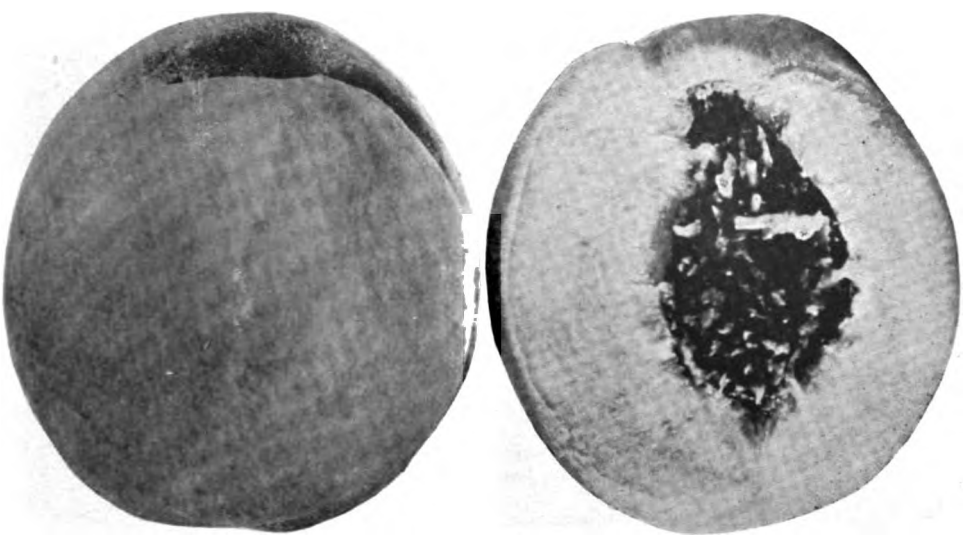
FRUIT: medium to large; dull yellowish colored with reddish blush; free stone.

FLESH: yellow, very firm.

QUALITY: the best late canning peach.

VALUE: first class for canning.

SEASON: mid-October, winds up season.



BEERS SMOCK.

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BELLE OF GEORGIA.

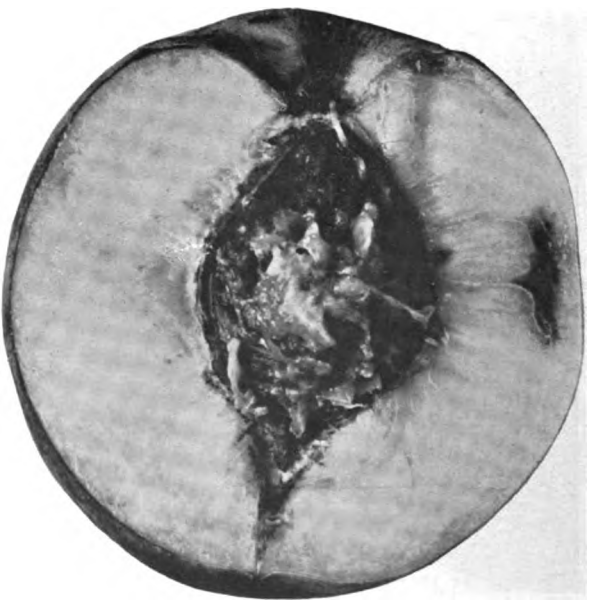
BELLE OF GEORGIA.

ORIGIN: Georgia.

TREE: hardy and productive; white fleshed; roundish, oblate; medium to large; color, creamy white, with red blush; free stone.

QUALITY: very good.

SEASON: with Elberta.



SECTION OF BELLE OF GEORGIA.

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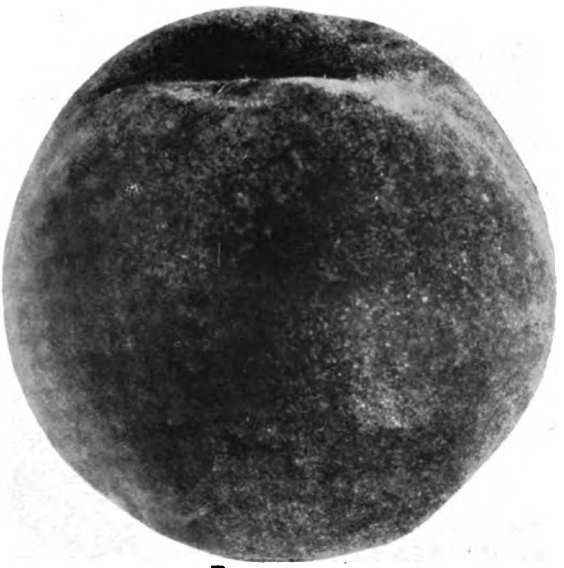
BRIGDON (*Garfield*).

A good commercial variety, of the Early Crawford class.

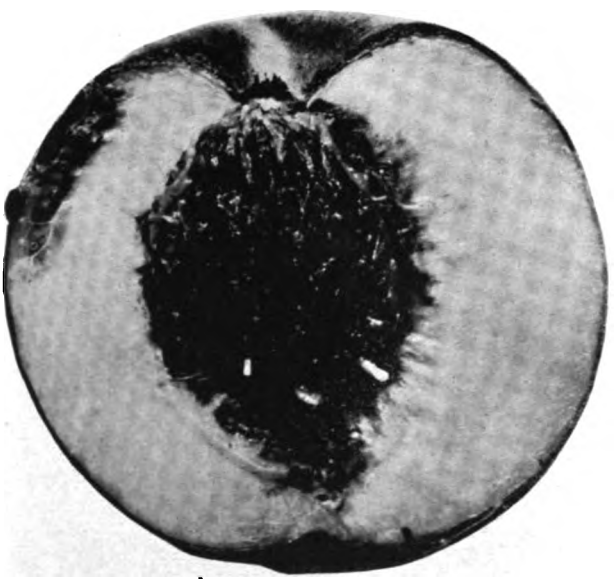
ORIGIN: New York State.

TREE: vigorous; productive.

FRUIT: size, medium to large; form, roundish oval; color, yellow with red cheek; suture traceable.



BRIGDON.



SECTION OF BRIGDON.

FLESH: free; color, yellow; texture, tender, very juicy; flavor rich, vinous.

QUALITY: first-rate for all purposes.

VALUE: first class for market.

SEASON: late August to early September.

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BOWSLAUGH.

Esteemed for canning, but inferior in size to the Longhurst, which it closely resembles.

ORIGIN: Grimsby, Ontario, with Mr. Bowslaugh.

TREE: productive.

FRUIT: size small to medium; color of skin, yellow with a dull red cheek; suture traceable more than half way around; cavity deep, irregular, apex prominent.

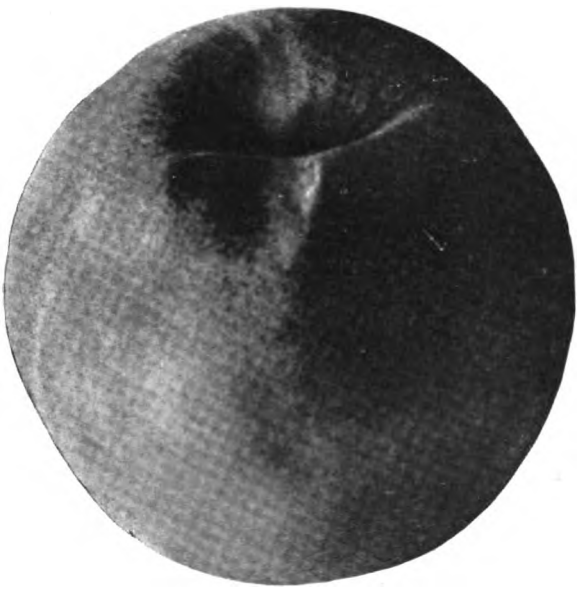
FLESH: free from pit; yellow, pink at pit; texture, tender, not very juicy, lacking in flavor, neither sweet nor acid.

QUALITY: dessert, poor; cooking, fair to good.

VALUE: market, second class.

SEASON: first half of October.

CARMEN.



CARMEN.

A very productive, handsome, white-flesh peach.

ORIGIN: Texas.

TREE: hardy, vigorous and productive.

FRUIT: large, resembling Elberta, creamy white, with deep red blush; skin very tough.

FLESH: white, tender and of fine flavor, juicy.

QUALITY: good.

VALUE: first class; highly commended in parts of New York State, and is doing well in Niagara Peninsula.

SECTION OF CARMEN.

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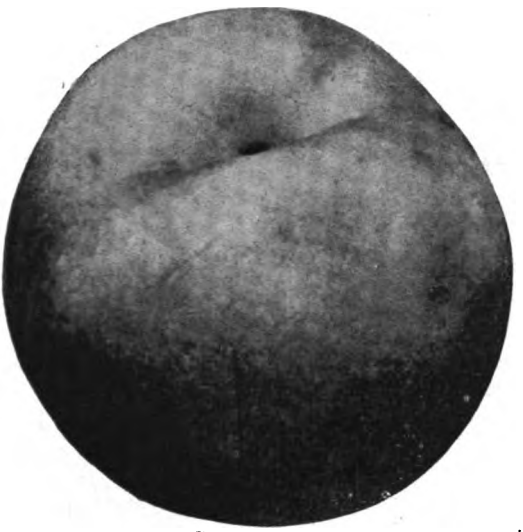
CHAIRS CHOICE.

ORIGIN: Maryland.
TREE: vigorous, productive, somewhat upright in growth.
FRUIT: very large, yellowish with red cheek, showy.
FLESH: yellow, juicy, tender, very agreeable.
QUALITY: excellent for dessert and shipping.
VALUE: a valuable variety on suitable location.
SEASON: just before Smock.

CHAMPION.



CHAMPION.

A beautiful white-fleshed peach with a red cheek, and free stone. The flavor is delicious, and it may be classed as the best dessert peach of its season, but a little tender for distant shipment.

ORIGIN: Illinois.

TREE: vigorous, moderately productive.

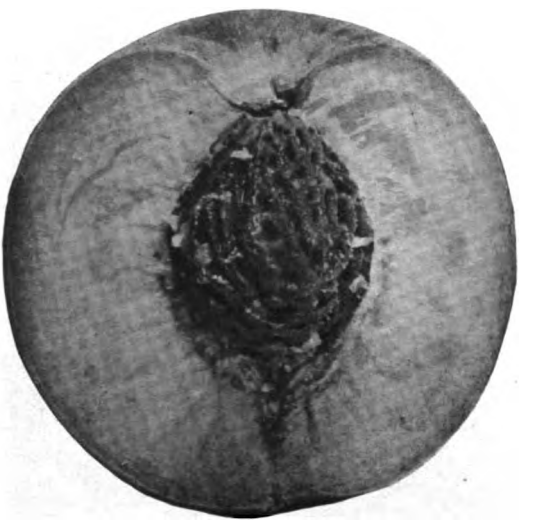
FRUIT: large; form roundish, fairly regular; color of skin, creamy white, with red cheek in the sun; suture visible two-thirds of the circumference; apex small in a slight depression; cavity deep; stone free.

FLESH: white, pinkish at the pit; texture, fine, tender, juicy; flavor, rich, sweet and agreeable.

QUALITY: dessert, among the best.

VALUE: first class for home markets, but rather tender for distant shipments.

SEASON: early September, coming in with last Yellow St. John and the first Early Crawfords.



SECTION OF CHAMPION.

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CROSBY (*Excelsior, Hale's Hardy*).

CROSBY.

A peach of good quality, but scarcely large enough for the commercial orchard.

ORIGIN: Massachusetts, 1876, by Mr. Crosby, nurseryman; named Excelsior by the Massachusetts Agricultural College; Hale's Hardy, because Mr. J. H. Hale was the first grower to plant it extensively, and finally Crosby by the United states Division of Pomology.

TREE: vigorous; healthy; fairly hardy; very productive.

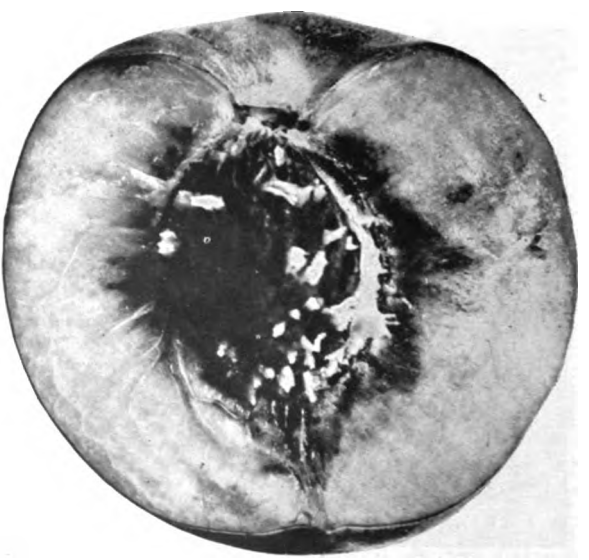
FRUIT: medium size; form almost round, slightly one-sided; color, yellow, with bright red cheeks; very pretty; cavity, deep, abrupt; apex small in a slight depression; suture, traceable.

FLESH: color, bright yellow, red at the stone; texture, fine, moderately juicy, tender; flavor, sweet and very agreeable.

QUALITY: very good for dessert and good for cooking.

VALUE: first class for home market.

SEASON: late September to early October.



SECTION OF CROSBY

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CHILI (*Hill's Chili*).

Recommended for drying; a good shipper.

ORIGIN: New York State.

TREE: fairly vigorous; productive.

FRUIT: medium to large; form roundish ovate; color, pale yellow, with red cheek; down, thick, whitish; cavity, narrow, deep; suture, marked; apex, a point.

FLESH: light yellow, tinted red at the pit; texture, tender, moderately juicy; flavor, subacid; free.

QUALITY: dessert, poor; cooking, good; drying, good.

VALUE: home market, second class.

SEASON: mid-September.

DEWEY (*Admiral Dewey*).

DEWEY.

An early, yellow-flesh, free stone.

ORIGIN: Georgia.

TREE: vigorous and productive.

FRUIT: medium, yellow-flesh, free stone, meaty.

FLESH: yellow, firm.

QUALITY: fair to good.

VALUE: some growers favor this variety, but the majority prefer St John.

SEASON: just before and with St. John.

SECTION OF DEWEY.

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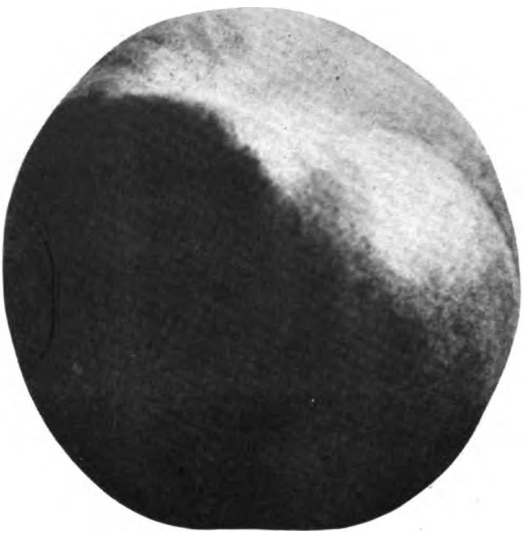
EARLY CRAWFORD.

Early Crawford has long held its place at the head of the list of peaches both for home use and for market. Its beautiful golden color, its large size, its free stone and rich flavor all unite in giving it a just claim to this position. Its buds are a little more tender than those of some other varieties, and, consequently, many growers hesitate to plant it, but where high cultivation and plenty of fertilizer is given, fine crops of luscious fruit have resulted.



EARLY CRAWFORD.

ORIGIN: Middleton, N.J., by Wm. Crawford.

TREE: vigorous; productive under favorable conditions; bloom not conspicuous.

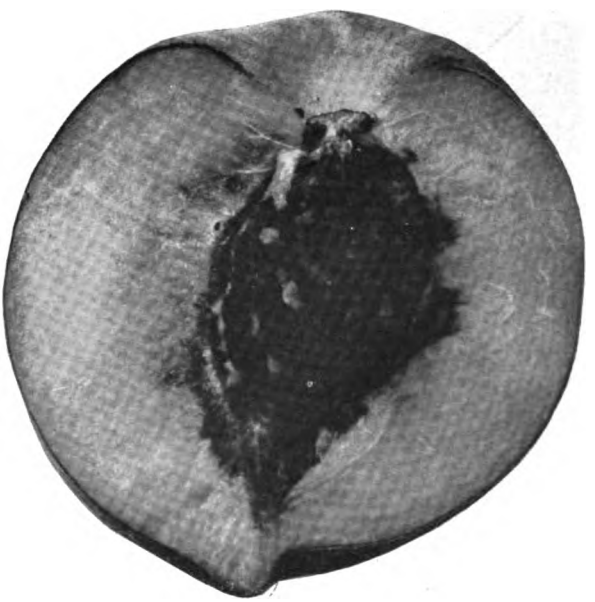
FRUIT: large to very large, oblong; suture, shallow; apex, prominent, swollen; color, golden yellow, with rich red cheek.

FLESH: color, yellow; flavor, sweet, rich; free from stone, which often parts in middle when nearly ripe.

QUALITY: dessert and canning, very good.

VALUE: first class for market.

SEASON: early September.



SECTION OF EARLY CRAWFORD.

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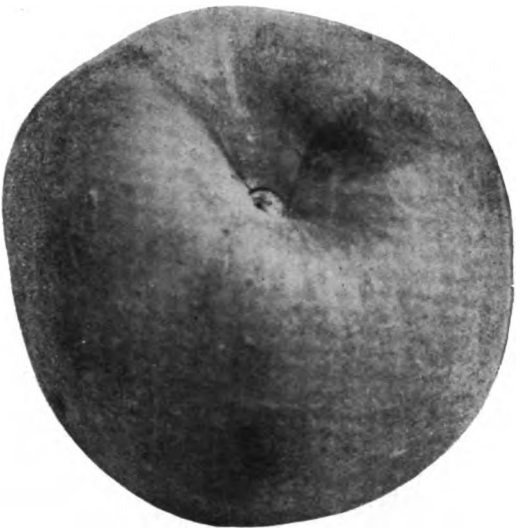
EARLY MICHIGAN.

A very good dessert peach.

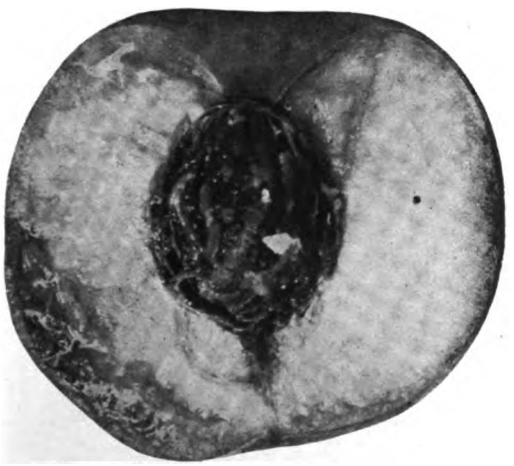
ORIGIN: Georgia.

TREE: healthy, vigorous and productive.

FRUIT: medium size, wide, form round; color, cream or greenish white ground, nearly covered with crimson; cavity, large and deep; suture, very distinct from cavity to apex and beyond; pit, a clingstone.



EARLY MICHIGAN.



SECTION OF EARLY MICHIGAN.

FLESH: greenish white, red at pit; texture, tender and juicy; flavor, subacid, very pleasant.

QUALITY: dessert, very good.

VALUE: market, second class.

SEASON: middle of August.

EARLY PURPLE.

For home use, as a dessert peach, this is one of the best of its season. Between 1860 and 1870 this variety was grown as the earliest market peach in Southern Ontario, but its extreme tenderness of flesh and rapid softening after maturity led to its giving place to other varieties.

TREE: thrifty; vigorous; hardy; fairly productive.

FRUIT: form, irregular, ovate, one-sided; skin, bright red, downy; basin, deep; stone almost free.

FLESH: greenish white in color; texture, very tender, very juicy melting; flavor, sweet, rich, agreeable.

QUALITY: dessert, very good; cooking, poor.

VALUE: near market, third class; distant market, poor.

SEASON: late August to early September.

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ELBERTA.

The best peach of its season for all markets and canning factories, and a variety especially suited for export by reason of its shipping qualities.

ELBERTA.

ORIGIN: Georgia; a cross between Chinese Cling and Early Crawford.

TREE: vigorous, hardy and moderately productive. The leaves are much subject to leaf curl, but this may be largely controlled by spraying.

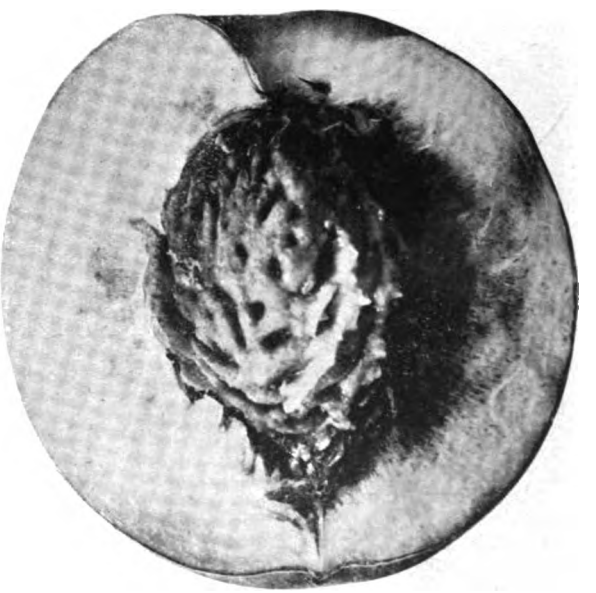
FRUIT: large, roundish oval, one side somewhat larger than the other; suture, distinct; skin, lemon yellow, with a fine red cheek; stone free, deeply corrugated, pointed.

FLESH: yellow; texture, moderately juicy.

QUALITY: dessert, fair; canning, best.

VALUE: home market, first class; foreign market, first class.

SEASON: late September, about a week later than Early Crawford.



SECTION OF ELBERTA.

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ENGOL (*Mammoth*).

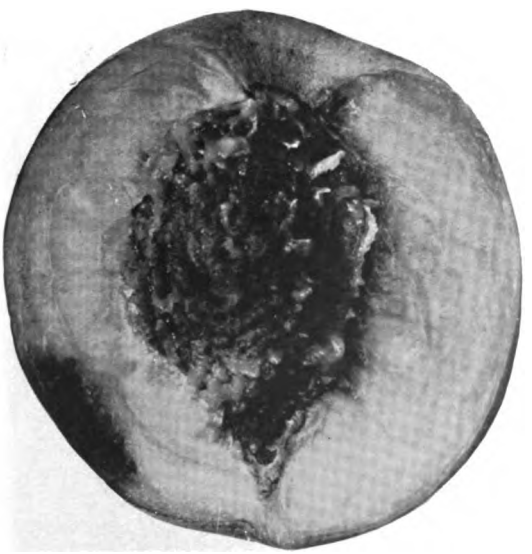
A valuable variety for either home use or market.

TREE: strong upright grower; quite productive.

FRUIT: medium to large; form roundish; cavity, medium; apex, slight; suture, a little over half around; color, yellow, with reddish cheek.

FLESH: color yellow, with tinge of red at pit; texture, tender, juicy; flavor pleasant, nearly sweet; free.

ENGOL.



SECTION OF ENGOL.

QUALITY: dessert or canning, very good.

VALUE: market, first class. Planted extensively in Essex County.

SEASON: first half of September.

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FITZGERALD.

FITZGERALD.

Since the Early Crawford has been such a popular peach both for home use and market, every new introduction of a variety which is of the same class, has been welcomed by the public, especially where it may be used to extend the season. The Fitzgerald is not so large as the Early Crawford, but to many the flavor is finer for dessert, and its season is a trifle later. Like the latter, it is too tender for very long shipments.

ORIGIN: in the garden of Mr. Fitzgerald, Oakville, Ontario, about 1895.

TREE: hardy, healthy and productive.

FRUIT: size medium to large; form roundish ovate; color, bright yellow, covered with deep red; down, moderate in quality; cavity broad and deep; apex, a small point in a slightly depressed basin; suture, distinct; stone free.

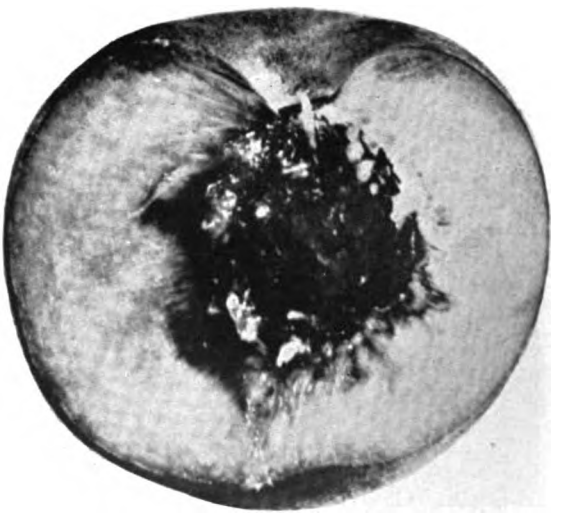
FLESH: yellow, with red at pit; texture, tender and juicy; flavor, excellent.

QUALITY: dessert, good.

VALUE: home market, first class.

SEASON: early to mid-September in Niagara district.

ADAPTATION: one of the hardiest varieties and successfully grown in Georgian Bay district.



SECTION OF FITZGERALD.

FOSTER.

A large yellow peach of the Early Crawford class, considered a little better in quality, but not so productive.

ORIGIN: J. T. Foster, Medford, Massachusetts.

TREE: vigorous; tender in fruit bud; not very productive.

FRUIT: size, large; form, roundish, slightly flattened; with a slight suture; color, bright yellow, shaded with orange red.

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FLESH: free; color, bright yellow, tinged with red at pit; texture, tender, juicy; flavor, rich, vinous, pleasant, subacid.
QUALITY: dessert, good; cooking, good.
VALUE: near market, first class.
SEASON: early to mid-September.

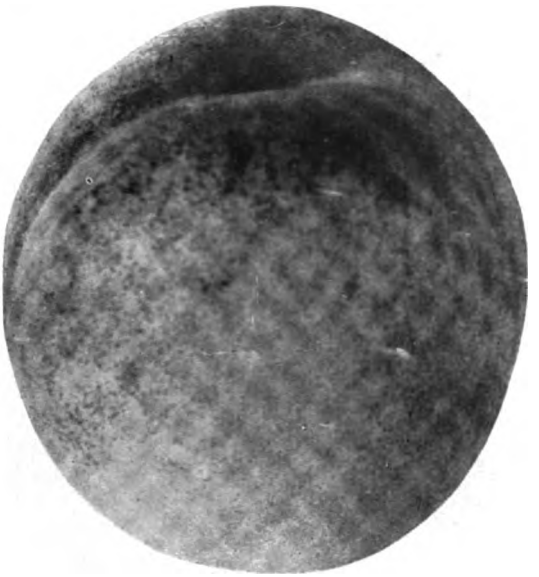
GREENSBORO.

The best white-flesh dessert peach of its season for local market.

ORIGIN: North Carolina.

TREE: vigorous; very productive; an early bearer.

FRUIT: large; form flattened; color, a deep cream with bright red cheek; cavity, narrow, deep; suture, slight; apex sunken; not subject to rot.



GREENSBORO.

SECTION OF GREENSBORO.

FLESH: color, cream; texture, tender, melting, very juicy; flavor, sweet and agreeable; free stone.

QUALITY: dessert, very good.

VALUE: first class for home market.

SEASON: mid-August.

GOLDEN DROP.

"Medium, roundish ovate; color rich yellow, or, as it grows in the South, 'a sort of transparent golden yellow,' often with a blushed cheek; cavity broad, shallow; suture, obscure except near apex. Flesh yellow, vinous, almost sweet, good; pit, free. Season, late September. Attractive in market." (*Budd.*)

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HALE (*Hale's Early*).

An early peach of very beautiful appearance, but inclined to rot before it ripens. The flesh remains firm, even after the outside presents the appearance of being ripe, so that it is not a favorite variety. Its comparative earliness at one time made it a very popular market variety, but its season is now preceded by that of Sneed, Greensboro, Early Rivers, Alexander and Triumph.

HALE.

ORIGIN: Ohio.

TREE: vigorous, healthy and productive.

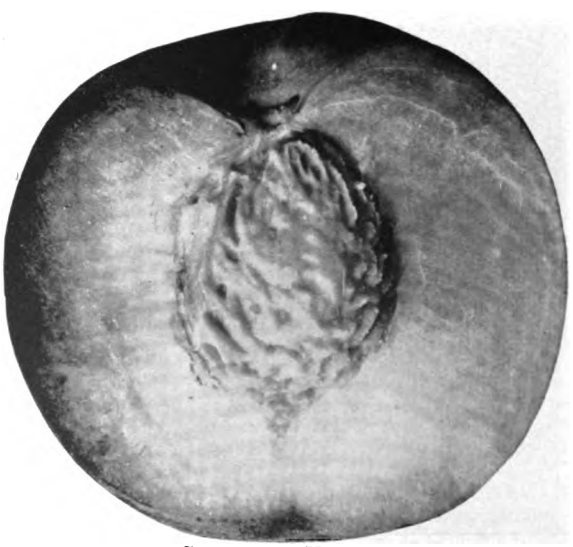
FRUIT: medium to large, form roundish; color of skin, dark red on sunny side, green with splash of red on shady side; apex, small, slightly pointed in dimpled depression; cavity, deep; suture extends to apex; pit, half free.

FLESH: greenish yellow to white; texture, firm until very ripe, then melting and juicy; flavor sweet and agreeable.

QUALITY: dessert and cooking, fair.

VALUE: home market, second class.

SEASON: late August.



SECTION OF HALE.

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JACQUES RARERIPE.

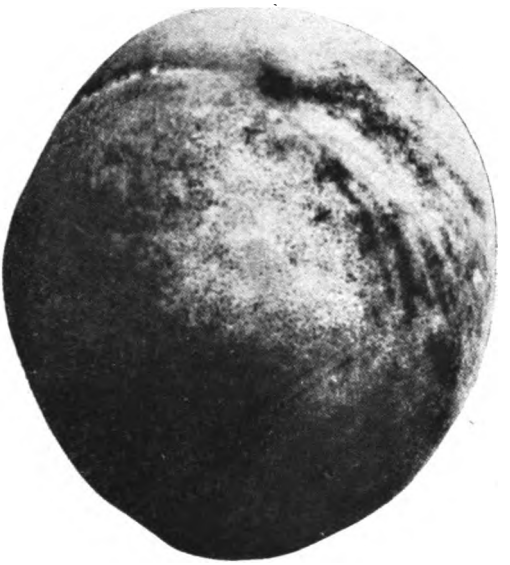
A fine yellow peach, succeeding the Early Crawford, but too tender in flesh for distant shipment.

ORIGIN: Massachusetts.

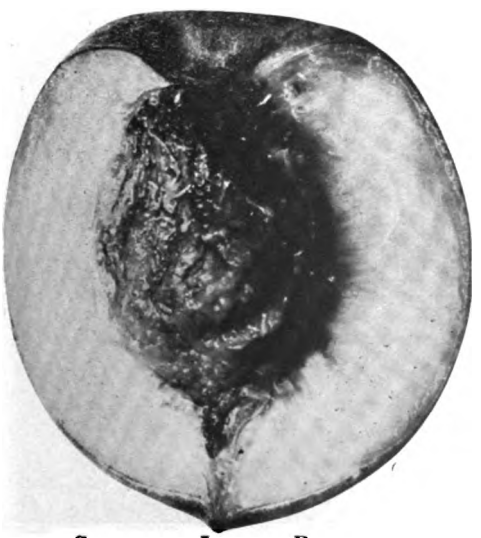
TREE: vigorous, healthy and productive.

FRUIT: size, large; form roundish oblate; color, dark yellow, shaded with red, especially on the sunny side; down, heavy; cavity, large and deep; apex in a depression; suture, distinct; stone, free.

FLESH: color, deep yellow, red at the pit; texture, tender, juicy; flavor, good, not very sweet.



JACQUES RARERIPE.



SECTION OF JACQUES RARERIPE.

QUALITY: dessert, very good; canning, very good.

VALUE: near market, first class; distant market, second class.

SEASON: mid-September.

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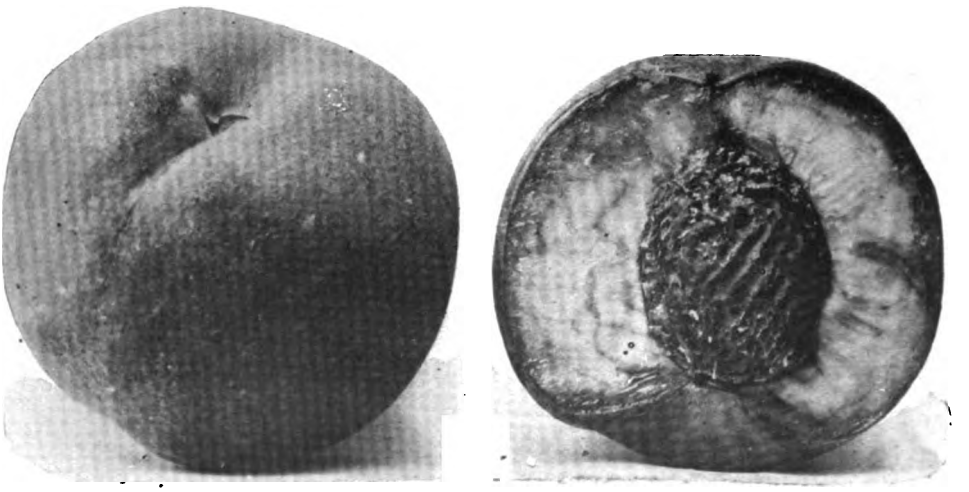
HYNES (*Hynes' Surprise*).

A very good early dessert peach, but the fruit is inclined to rot in wet seasons.

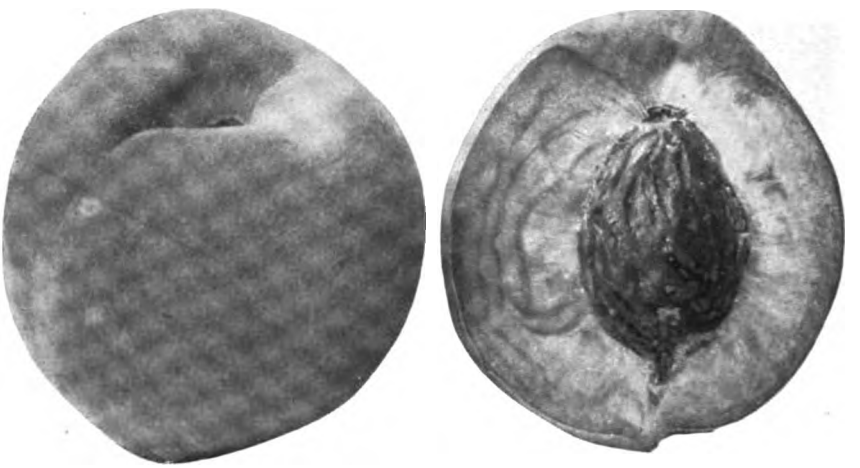


HYNES.

ORIGIN: introduced in 1895, by Mr. S. D. Willard, of Geneva, N.Y.
TREE: vigorous; productive.
FRUIT: form roundish, slightly one-sided; size, small; color, greenish white with bright red cheek, sometimes deep red in the sun; cavity, narrow and deep; suture, distinct; dots, numerous; skin, thin and tenacious; stone, semi-cling.
FLESH: color, yellowish white; texture, juicy; flavor, sweet and agreeable.
QUALITY: dessert, good to very good.
VALUE: home market, first class; distant market, third class.
SEASON: mid to late August.

KALAMAZOO.

A popular market peach in Michigan; inferior to Elberta.
ORIGIN: Michigan.
TREE: vigorous and very productive.
FRUIT: medium in size, form roundish oval, sides unequal; color, yellow, with red cheek; cavity, deep, narrow, irregular; apex, a small point in a slight depression; suture, traceable beyond the apex; free stone.



KALAMAZOO.

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FLESH: color, yellow, red at pit; texture, moderately tender and juicy; flavor, fairly sweet.

QUALITY: dessert, poor; canning, good.

VALUE: near market, good; rather too small to sell with Elberta, or even to follow that large, showy variety.

SEASON: mid to late September.

LATE CRAWFORD.

A fine, large yellow peach, equal to Early Crawford in flavor. It has not been very profitable because the tree is not very productive.

ORIGIN: New Jersey.

TREE: vigorous; only fairly productive.

FRUIT: large to very large; color, dull yellow or olive green, with dark red cheek; cavity, large and deep; suture, traceable; free stone.

FLESH: deep yellow, red at the stone; texture, juicy and melting; flavor, rich, vinous.

QUALITY: dessert, good; cooking, very good.

VALUE: market, first class.

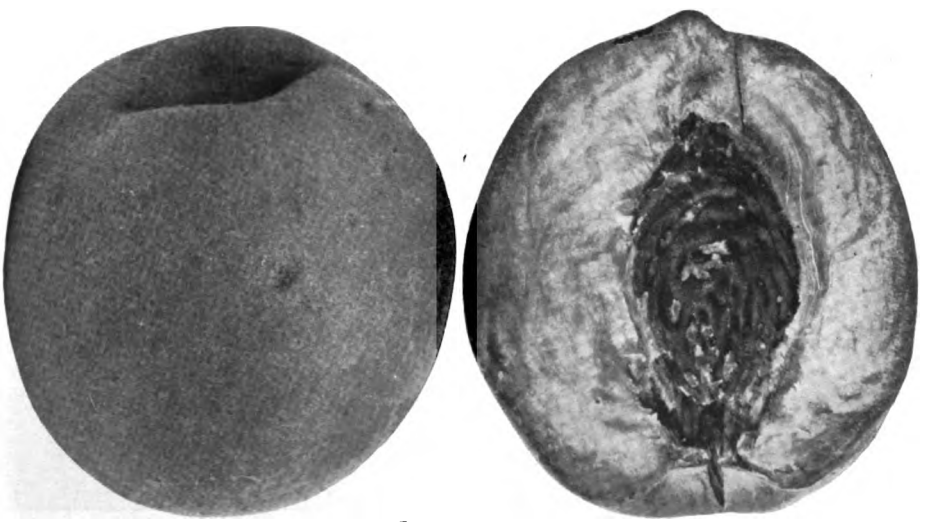
SEASON: late September.

LONGHURST.

A very productive late variety, highly esteemed for canning. It is considered a profitable variety by many peach growers, but unless given the best culture, the fruit is small and unattractive in appearance.

TREE: hardy; fairly vigorous; very productive. Budd says the fruit buds of this variety have proven exceptionally hardy in Michigan.

FRUIT: medium in size; form, oval, larger on side of suture, which is clearly traceable, ending in a pointed apex; color, dull yellow, with dark red cheek in sun; down, thick; cavity, deep, abrupt, shouldered; pit, small, free.



LONGHURST.

FLESH: color, yellow, red at pit; texture, tender, almost buttery, moderately juicy; flavor vinous, sweet, agreeable.

QUALITY: dessert, fair; canning, very good.

VALUE: valuable for canning, but owing to its productiveness this variety must be thinned rigorously and heavily fertilized or else absolutely abandoned.

SEASON: late September to early October.

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LEAMINGTON.

LEAMINGTON.

Medium to large, white with red cheek; quality, excellent; juicy, sweet white flesh. Ripens about a week to ten days before Early Crawford, and is a free stone. Very productive.

LEMON CLING.

A large and showy peach, at one time planted freely in Ontario orchards, but of late discarded because of its cling stone.

ORIGIN: South Carolina.

TREE: vigorous, hardy and productive.

FRUIT: large, form roundish, narrowed towards apex, which is large and prominent, somewhat like that of the lemon; skin, deep yellow, with a dark brownish-red cheek.

FLESH: color, yellow, tinged with red at the pit; texture, firm, not very juicy; flavor, pleasant, sprightly, subacid.

QUALITY: dessert, fair; cooking, fair.

VALUE: third class. It is not advisable to have any cling stones at this time of season.

SEASON: late September.

LEWIS.

A fine market peach to succeed St. John and to precede Early Crawford.

ORIGIN: Michigan.

TREE: healthy, vigorous, very productive.

FRUIT: medium to large; form round; color, yellowish white, largely overspread with red; suture, depressed.

FLESH: yellowish white, red next to pit; texture, tender, juicy; flavor, very pleasant.

QUALITY: dessert, good; cooking, good.

VALUE: home market, first class; distant market, second class.

SEASON: mid-September.

McCONNELL.

A very attractive-looking, late, white-flesh peach.

ORIGIN: a seedling raised by Mr. McConnell, Essex County.

TREE: a good, thrifty grower; productive.

FRUIT: above medium; color, white with beautiful crimson blush; form, round.

FLESH: cling; color, pure white; texture, firm, juicy; flavor, pleasant.

QUALITY: dessert, poor; cooking, poor; good pickler.

VALUE: not tested.

SEASON: mid-October.

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MATTHEW (*Matthew's Beauty*).

A fine attractive appearing yellow peach, with beautiful cheek, resembling Elberta in exterior, but nearly a week later, and of much better quality. From its appearance it might be called "late Elberta."

FRUIT: form, roundish ovate, slightly flattened; size, about 2¼ inches; color, yellow with dark red cheek; suture, half round; apex, depressed; cavity, narrow, deep.

FLESH: free; color, yellow; texture, moderately firm; flavor, sweet, good.

QUALITY: dessert or cooking, very good.

VALUE: market, first class.

SEASON: late September to early October.

MOUNTAIN ROSE.

Desirable in the home garden as a dessert peach only.

ORIGIN: New Jersey.

TREE: vigorous; productive.

FRUIT: size, medium to large; form, roundish; suture, traceable; apex, a point; color of skin white, with bright red cheek.

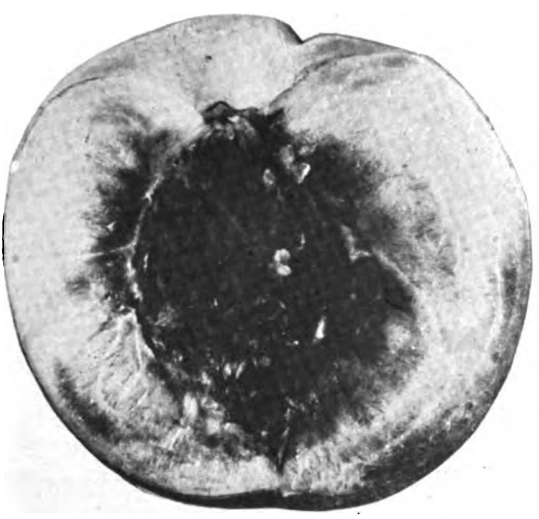
FLESH: creamy white, with red tint at the pit; texture, tender, melting, very juicy; flavor, sweet, delicious; free.

QUALITY: first class for dessert.

SEASON: early to mid-September.

VALUE: market, second class.

MOUNTAIN ROSE.



SECTION OF MOUNTAIN ROSE.

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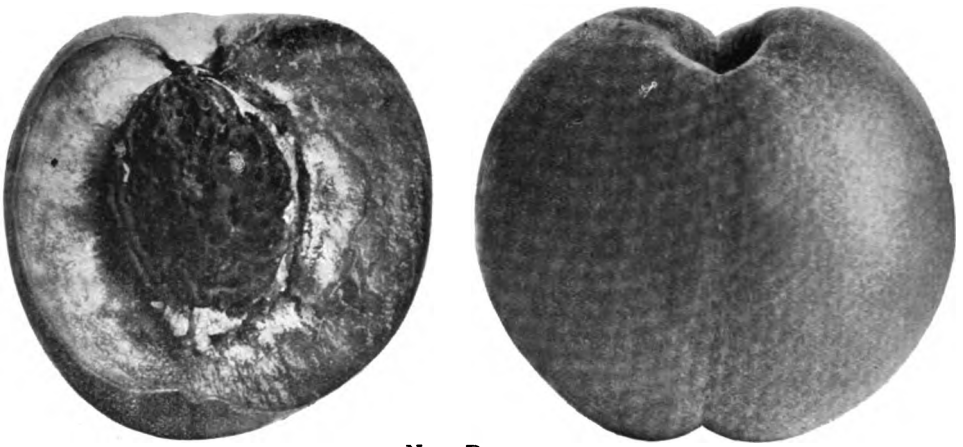
NEW PROLIFIC.

A peach of the Crawford type, a few days later, which is highly esteemed by many peach growers. Like the Crawford, it is too tender in flesh.

TREE: healthy; vigorous; very productive.

FRUIT: size, medium to large; form, round; color, yellow, with bright red cheek; cavity, narrow and deep; suture, distinct, extending beyond the apex.



NEW PROLIFIC.

FLESH: yellow; slightly tinted with red at the pit; texture, tender; flavor, sweet; delicate; very pleasant; free from pit.

QUALITY: dessert, first class; canning, first class.

VALUE: first class.

SEASON: mid to late September.

OCEANA.

A cross between Early Crawford and Hill's Chili.

TREE: hardy and productive; vigorous.

FRUIT: medium to large, very attractive, yellowish with red blush.

FLESH: yellow, free stone, firm.

FLAVOR: good.

VALUE: very promising in Niagara district; said to be a good shipper.

SEASON: before Late Crawford.

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NIAGARA.

ORIGIN: Niagara County, New York.

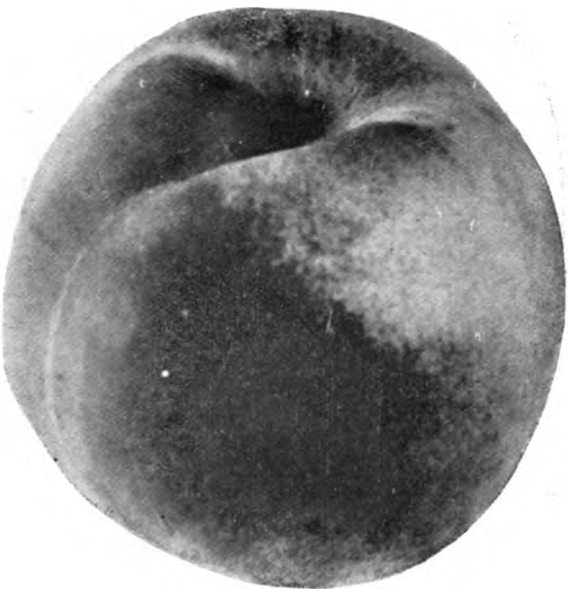
TREE: hardy, productive.

FRUIT: large, round, yellow with pink cheek; free stone; flesh yellow; flavor rich.

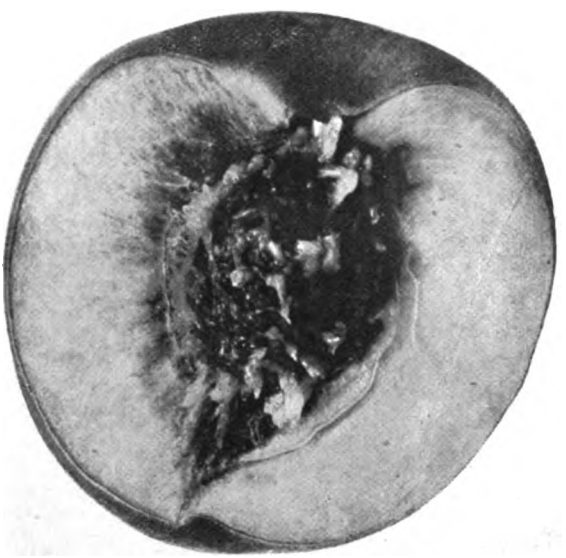
QUALITY: good.

VALUE: first class.

SEASON: after Early Crawford.



NIAGARA.



SECTION OF NIAGARA.

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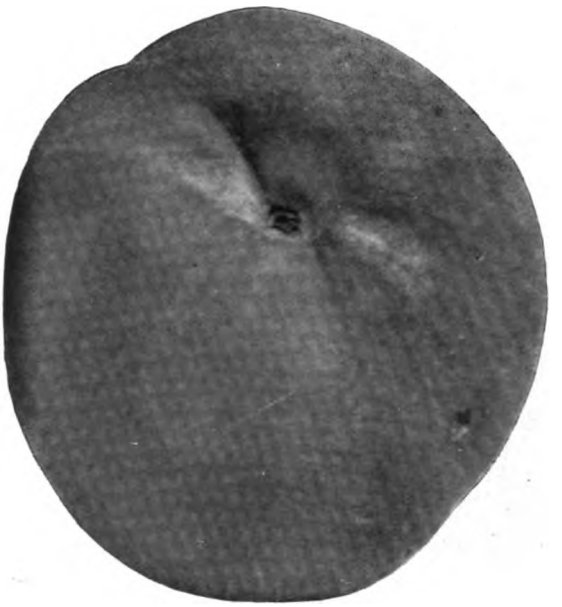
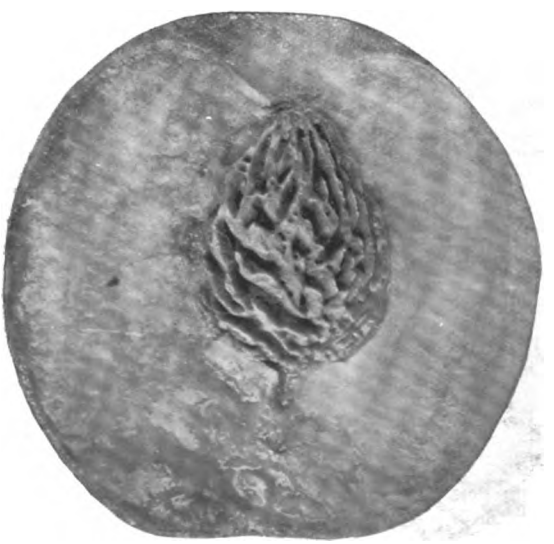
RIVERS (*Early Rivers*).

When first introduced, this peach was widely planted for market because of its fine size and early season, coming in between Alexander and Hale. Its great fault is its delicate skin and tender flesh which show the slightest bruise, so that the most careful handling is necessary. The fruit needs thinning for size and color, and then it can be sent only to the nearest markets.



RIVERS.



SECTION OF RIVERS.

ORIGIN: by Thos. Rivers, of Sawbridgeworth, England.

TREE: very vigorous; fairly hardy; very productive.

FRUIT: medium to large, roundish, often somewhat oblong and flattened on the sides, and more or less one-sided; skin smooth, light green, almost white, delicately shaded with red; cavity, small and deep; apex, small, in a narrow, deep depression; suture, deep and distinct; stone, half cling, inclined to split.

FLESH: color, creamy white; texture, melting, juicy.

QUALITY: fair for dessert; fair for cooking.

VALUE: second class for near market.

SEASON: mid-August.

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OLDMIXON FREE.

An old standard variety considerably planted in the older commercial peach orchards of the Niagara Peninsula; a white flesh peach with a red cheek, presenting a good appearance in the basket; its fault as a market variety is its dropping almost before it has attained full color and its tender flesh; valuable for dessert purposes.

ORIGIN: a seedling of Oldmixon Cling which was brought to America by Sir John Oldmixon.

TREE: vigorous; spreading; moderately productive.

FRUIT: medium to large; form roundish oval, one-sided; suture, distinct toward the apex, which is not marked; cavity, narrow; color, creamy white, marbled with red and with a deep red cheek; bloom, thin.

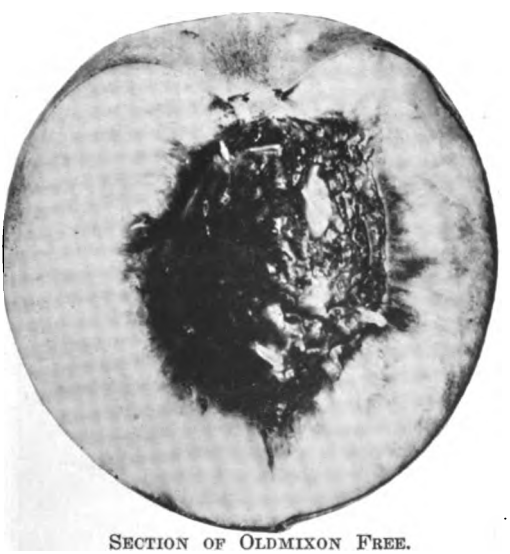
FLESH: free stone; color, creamy white, red at pit; texture, tender; flavor, sweet, rich, vinous.

OLDMIXON FREE.

QUALITY: dessert, very good; cooking or canning whole, very good.

VALUE: market, hardly first class compared with larger yellow varieties of the same season.

SEASON: early September.



SECTION OF OLDMIXON FREE.

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REEVES FAVORITE.

REEVES FAVORITE.

A profitable peach because of its large size and excellent color, but lacking in productiveness.

ORIGIN: in New Jersey, by Samuel Reeves.

TREE: thrifty; upright; moderately productive.

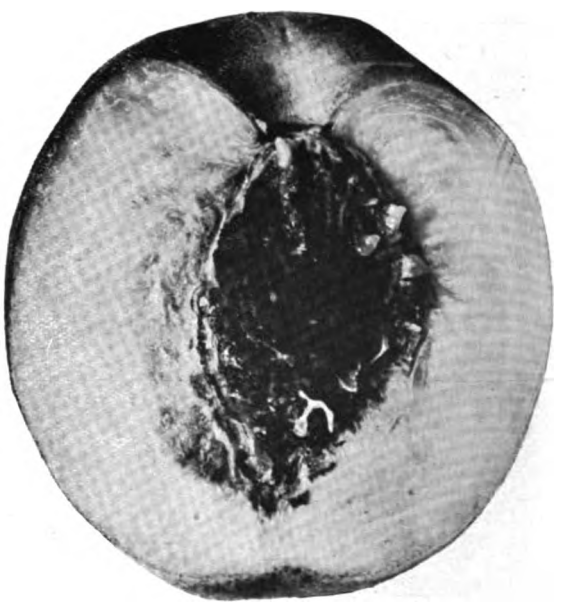
FRUIT: large, form roundish; color, yellow with red cheek; cavity, deep and broad; suture, traceable; apex, pointed, distinct.

FLESH: color, yellow, with red tint at the pit; texture, tender, juicy; flavor, sweet, vinous, very pleasant; free.

QUALITY: dessert, good; canning, good.

VALUE: market, first class.

SEASON: mid-September, a few days later than Early Crawford.



SECTION OF REEVES FAVORITE.

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REID.

A round yellow-flesh peach, closely succeeding Elberta.

TREE: healthy, vigorous, productive.

FRUIT: medium to large in size; form, roundish ovate; color, yellow nearly covered with red; suture, distinct; apex, depressed, prominent.

FLESH: free; color, yellow marked with red at pit; texture, tender, juicy; flavor, moderately sweet.

QUALITY: cooking, good; dessert, fair.

VALUE: market, second class.

SEASON: late September.

SALWAY.

A popular late market variety, which usually ripens in the peach sections of Ontario before frost. Hilborn says that in Essex it reaches maturity four years out of five.

ORIGIN: England.

TREE: vigorous; productive; fairly hardy.

FRUIT: large; roundish, somewhat one-sided; skin, yellow with red cheeks on sunny side; suture, broad.

FLESH: free; color, yellow, red at the pit; texture, tender, juicy; flavor, sweet, good.

QUALITY: good.

VALUE: market, first class if well ripened.

SEASON: mid-October.

SMOCK.

A first-class late market peach.

ORIGIN: New Jersey.

TREE: moderately vigorous; wood brittle; leaves not subject to curl; productive.

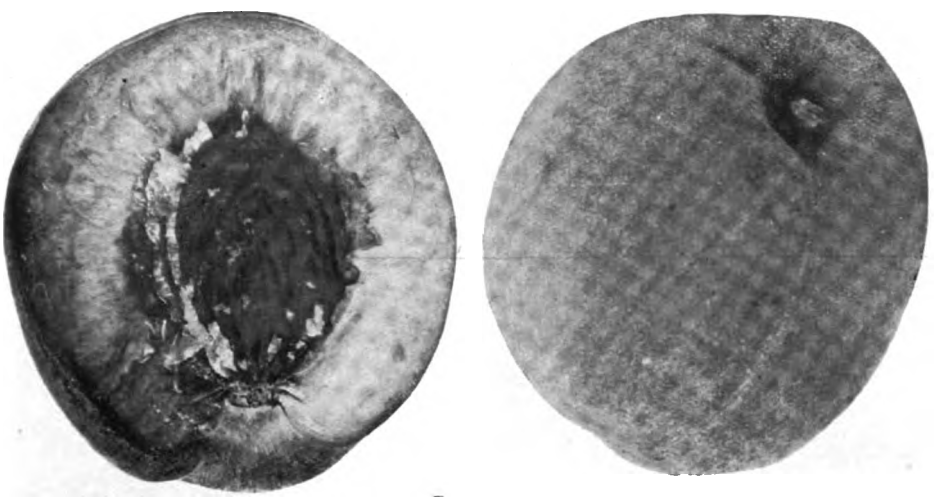
FRUIT: large; oval; color, yellow with orange-red cheek; bloom, heavy; cavity, narnow and deep; suture, obscure; apex, slightly extended.

FLESH: free; color, yellow, with red at pit; texture, dry, tender; flavor, agreeable, not sweet, distinctive.

QUALITY: cooking or drying, good.

VALUE: market, first class for its season.

SEASON: early October.



SMOCK.

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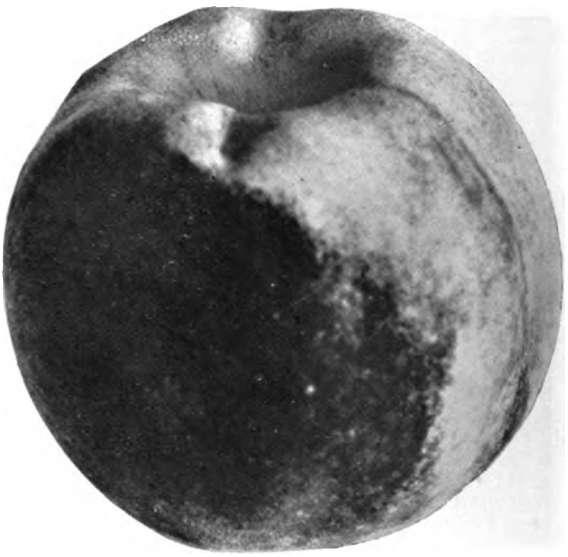
ST. JOHN (*Yellow St. John*).

The earliest really good peach for either home use or market. Its season is the end of August, just before the Early Crawford; and its fair size, its yellow flesh, attractive skin and good quality, make it one of the most satisfactory peaches for all purposes.

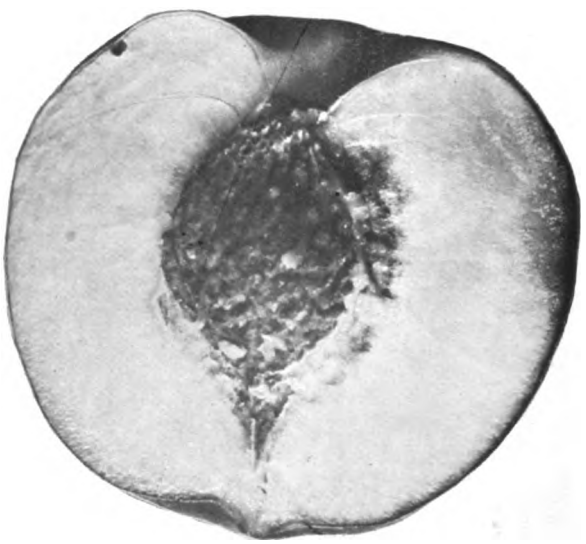
ORIGIN: North America.

TREE: vigorous and productive.

FRUIT: form, round; size, large; skin, yellow, with dark red cheek; suture, traceable on one side, sometimes by a red line; apex, a tiny point in a rather deep depression; free stone.



ST. JOHN.



SECTION OF ST. JOHN.

FLESH: color, yellow, tinted red at the stone; texture, tender and juicy; flavor, sweet, rich and agreeable.

QUALITY: dessert, very good and canning very good.

VALUE: the first good yellow-flesh peach of the season.

SEASON: late August.

SNEED.

A promising early variety for home use and near markets.

ORIGIN: Tennessee, by Judge Sneed, of Memphis, about 1880, from a pit of the Chinese Cling.

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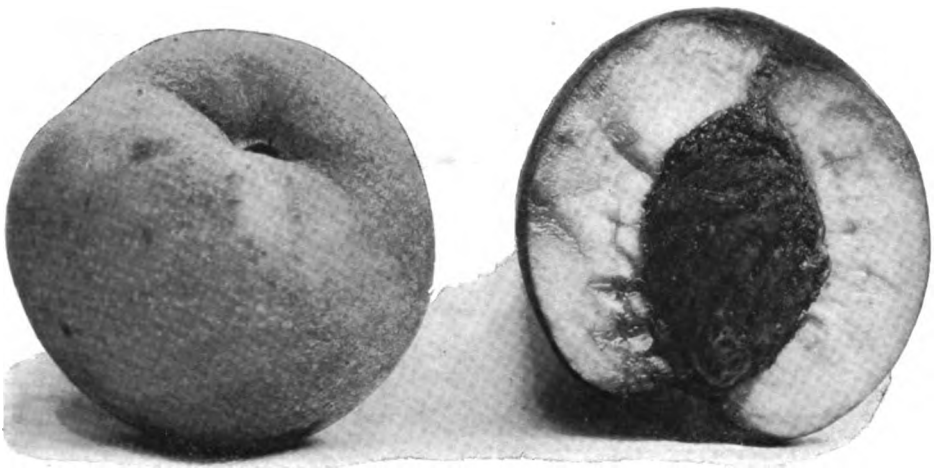
TREE: vigorous, but slender in young growth; productive; an early bearer.

FRUIT: medium; form, roundish oval, slightly one-sided; skin light greenish white, with red cheek, and a short thick down; cavity, narrow and deep, with distinct suture, and a small pointed apex, in a slight depression.



SNEED.

FLESH: semi-cling; color, yellowish white at maturity; texture, tender, fine, very juicy; flavor, mild, vinous, pleasant.

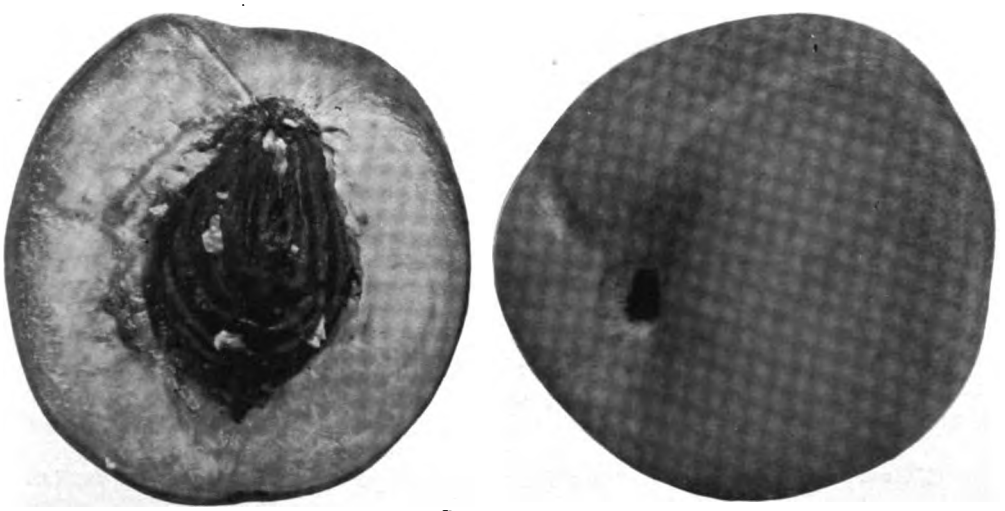
QUALITY: dessert, good.

VALUE: home market, second class.

SEASON: late July to early August.

STEVENS (*Stephens Rareripe*).

A popular late white-flesh peach, and a good shipper.



STEVENS.

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ORIGIN: New Jersey.

TREE: vigorous and productive.

FRUIT: size, above medium; form, roundish ovate; color, whitish ground with dark red cheek; cavity, narrow and deep; suture, traceable.

FLESH: whitish with red at pit; free; texture, tender, juicy; flavor, sprightly and agreeable.

QUALITY: dessert, good; cooking, good.

VALUE: market, first class.

SEASON: mid-October.

THURBER.

A magnificent white-flesh peach to fill in between Early Crawford and Elberta.

ORIGIN: seedling of Lee, raised by Dr. L. E. Berckmans, of Augusta, Georgia.

TREE: very vigorous; productive.

FRUIT: size, large; form, roundish, enlarged at centre along suture; color, creamy white, bright red cheek; cavity, large, deep; suture, marked; apex, small, pointed; bloom, white; skin thin.

FLESH: white, red at pit, free; texture, tender, juicy; flavor, sweet, vinous, excellent.

QUALITY: dessert, very good to best; cooking or canning, very good.

VALUE: home market, first class.

SEASON: mid-September.

TYHURST.

A very attractive golden-yellow peach; considered a profitable variety for the commercial orchard. After fruiting it several years at our Maplehurst station, we think its value has been somewhat over-estimated. It is not planted in Niagara Peninsula.

ORIGIN: a seedling raised by Mr. Tyhurst, of Leamington, Essex County. This gentleman was so pleased with the peach that he planted nearly his whole farm with trees grown from its pits, and made considerable money out of his venture.

TREE: moderately vigorous; quite productive; fruit is inclined to drop as soon as ripe.

FRUIT: size, medium; form, ovate; suture, distinct on one side, terminating in a small, black, sharp point; color, deep yellow, with tinge of red in the sun; skin separates easily from the flesh.

FLESH: free; color, pale yellow; texture, very tender, fine grained, melting, juicy; flavor, excellent.

QUALITY: dessert, very good to best; canning, very good.

VALUE: home market, first class; distant market, second class, because too tender.

SEASON: mid-September.

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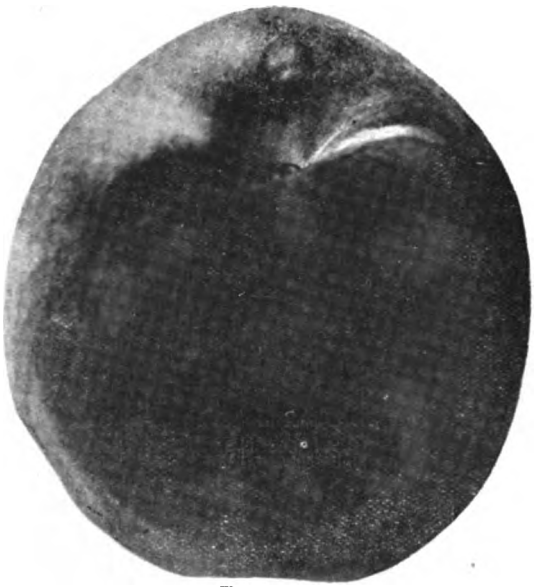
TRIUMPH.

A valuable commercial variety, to follow the Alexander, but not very popular on account of its heavy coat of down, its dull color, and its susceptibility to rot, and should only be planted in earliest section.

ORIGIN: Georgia, seed of Alexander.

TREE: vigorous, hardy, very productive, subject to twig blight and leaf curl.



TRIUMPH.

FRUIT: medium size; form, roundish, somewhat shouldered and flattened; color, yellow ground nearly covered with red and markings of very dark red; cavity, deep; apex, small, in a decided depression; suture, distinct; pit, semi-cling.

FLESH: yellow; texture, fine, juicy; flavor, sweet, rich and excellent.

QUALITY: good.

VALUE: home market, second class except under special conditions.

SEASON: mid-August.

SECTION OF TRIUMPH.

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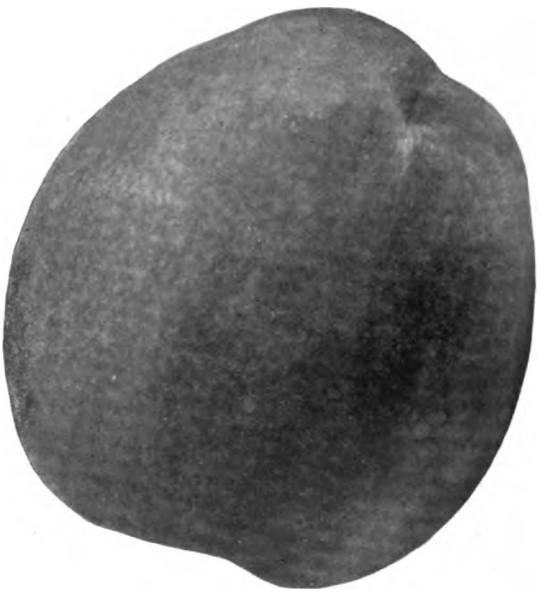
WHEATLAND.

A large and beautiful yellow-flesh peach to follow Early Crawford; a valuable variety for home use or market; not a long keeper.

ORIGIN: New York State.

TREE: vigorous.

FRUIT: size, large; form, roundish, slightly enlarged along the line of suture; color, yellow, well overspread with red, usually prettily dappled with red about the small pointed apex; cavity, broad and deep.



WHEATLAND.

FLESH: free; color, pale yellow tinted with red at the pit; texture, melting, tender, juicy; flavor, rich, sweet, delicious.

QUALITY: very good for dessert or cooking.

VALUE: market, first class.

SEASON: mid to late September

WILLETT.

An attractive and profitable late market peach, to come in between Elberta and Smock; later than Matthews' Beauty.

TREE: vigorous; spreading; productive.

FRUIT: medium to large in size; form, nearly round, and enlarged along one side of the suture; cavity, abrupt, medium; apex, distinct; color, yellow with mottling of deep red in the sun.

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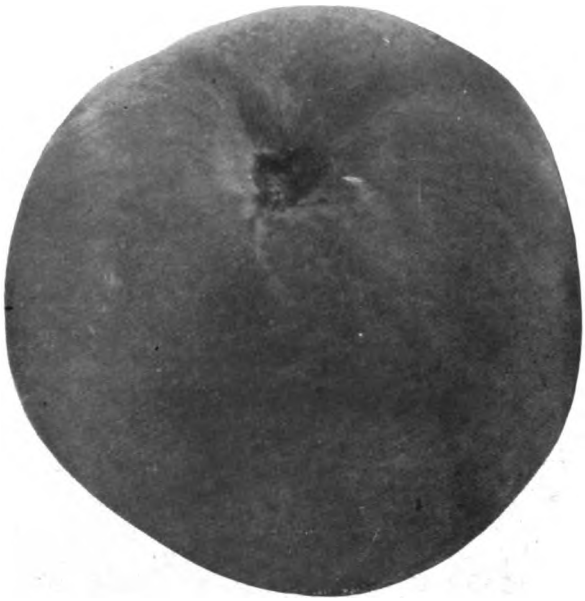

WILLETT.

SECTION OF WILLETT.

FLESH: free; greenish yellow with red tint at the pit; texture, rather firm, moderately juicy; flavor, moderately sweet, good.

QUALITY: dessert, good; cooking, very good.

VALUE: market, first class.

SEASON: early October.

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WONDERFUL.

A new variety of great size and beauty.
ORIGIN: United States.
TREE: a vigorous grower, but lacking in productiveness.
FRUIT: large; form, roundish; cavity, narrow and deep; suture, traceable; apex a small point, sometimes depressed; color, yellow with bright red on sunny side.

WONDERFUL.

FLESH: light creamy yellow, red at pit; texture, tender, melting, juicy; flavor, sweet, vinous, pleasant; free.
QUALITY: dessert, good; canning, good.
VALUE: market, first class.
SEASON: mid-September.

SECTION OF WONDERFUL.

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THE PEAR.

The pear succeeds over all the best apple districts of Ontario, but few good hardy varieties have yet been found, hence the commercial culture of the pear does not extend as far north as the apple. The principal pear orchards are found in southern Ontario. There are many good orchards, however, along Lake Ontario as far east as the Bay of Quinte and north to the Georgian Bay.

In eastern Ontario, only a few kinds succeed, and these are not planted on a commercial scale. These hardy varieties are grown to a limited extent for home use as far north as latitude 45 degrees and some of the Russian pears, though inferior in quality and very subject to blight, may be grown still further north.

The pear stands distant shipment well, if picked at the right time, and properly packed and handled in transit, and hence larger quantities are being sent to distant markets every year, and, as a rule, good prices are obtained for the fruit.

The general directions for the preparation of the land, soil and planting, as given for the apple, apply to the pear, with but slight alterations. While pears succeed in the same kind of soils as the apple, clay loams, if well drained, suit them best. Pear trees two years old are better than those three years old, as they are easier to transplant, since pear trees have not so good a root system as the apple. Standard trees should be set at least twenty feet apart each way. Pear trees are shaped and pruned much like the apple, although trees with a central leader are more easily obtained and are preferred. They may be headed nearer the ground than the apple, as they are of more upright habit. Many pears are now being grown on dwarf or quince stock. These have the advantage of being earlier than standard trees, and may be planted closer together, fourteen feet apart being a good distance. They do not live as long as standard trees. The dwarf trees in Ontario are almost always grown without a central leader, and branching near the ground. They require more careful pruning than standards. The fruit of some varieties is improved by growing on dwarf stocks, among those succeeding particularly well on this stock being Duchess, Louise, Diel, and Easter Beurre.

Pear trees are very much subject to blight, which, as yet, cannot be controlled by any practical means. It has been observed, however, that trees usually blight most when making strong, succulent growth, hence it is best not to encourage a strong growth. Some varieties are more subject to blight than others, and when planting, this should be taken into consideration. In planting a pear orchard, it is also desirable to mix the varieties, avoiding large blocks of any one kind, as better crops will thus be obtained, some varieties being almost sterile, when planted by themselves.

The picking of pears requires good judgment. If they are picked too early, the fruit will not get its best flavor, but, if picked too ripe, it will spoil before reaching the market. Pears, unlike most fruits, ripen well and develop a good flavor when picked while still green and hard, but, to obtain this flavor, the fruit should have reached its full size.

VARIETIES RECOMMENDED.

GENERAL LIST, APPROVED BY THE BOARD OF CONTROL.

Giffard, Clapp, Bartlett, Boussock, Flemish (hardy, subject to spot), Howell, Louise, Duchess, Bosc, Clairgeau, Anjou, Kieffer.

DISTRICT LISTS.

NIAGARA DISTRICT.

(Including the Niagara Peninsula from the Niagara River to Hamilton and north to the escarpment.)

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ROBERT THOMPSON, St. Catharines.

Giffard, Clapp, Bartlett, Bosc, Duchess (dwarf), Anjou, Kieffer.

EGBERT M. SMITH.

Giffard, Bartlett, Howell, Louise, Flemish, Duchess (dwarf), Anjou, Kieffer.

BURLINGTON-OAKVILLE DISTRICT.

(Including the southern part of the counties bordering on Lake Ontario between Hamilton and Toronto.)

A. W. PEART, Burlington.

Wilder, Clapp, Bartlett, Boussock, Louise, Duchess (dwarf), Anjou, Kieffer, Lawrence, Nelis.

W. F. W. FISHER, Burlington.

Lawson, Clapp, Bartlett, Duchess, Anjou, Nelis.

ESSEX PENINSULA.

(Including Essex, Kent, and Pelee Island.)

J. L. HILBORN, Leamington.

Bartlett, Anjou, Duchess.

J. ATKIN & SON, Leamington.

Bartlett, Kieffer, Duchess.

LAKE HURON DISTRICT.

(Including Counties of Huron and Bruce.)

D. F. HAMLINK, Goderich.

Clapp, Bartlett, Louise, Clairgeau, Anjou.

GEORGIAN BAY DISTRICT.

(Including northern portions of the Counties of Grey and Simcoe, bordering on the Georgian Bay.)

J. G. MITCHELL, Clarksburg.

Clapp, Bartlett, Flemish, Duchess, Anjou, Clairgeau.

LAKE SIMCOE DISTRICT.

(Including the northern and eastern section of Simcoe and northern sections of York and Ontario, bordering on Lake Simcoe.)

G. C. CASTON, Craighurst.

Clapp and Bartlett.

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GUELPH DISTRICT.

(Including the high inland Counties of south-western Ontario, *i.e.*, Wellington, Waterloo, north-western section of Perth, south part of Grey, Dufferin, and north-west section of Peel and Halton.)

Prof. J. W. CROW, O.A.C., Guelph.

Clapp, Flemish, Seckel, Sheldon, Anjou.

LAKE ONTARIO DISTRICT.

(Including the southern portions of the Counties bordering on the Lake Ontario shore from Toronto to Trenton.)

W. H. DEMPSEY, Trenton.

Giffard, Clapp, Boussock, Hardy, Bosc, Clairgeau, Lawrence.

ST. LAWRENCE VALLEY DISTRICT.

(Including the Valley of the St. Lawrence River from Kingston to the eastern boundary of the Province.)

HAROLD JONES, Maitland.

Flemish (if grown in sod), Ritson (not so hardy in fruit bud as Flemish).

OTTAWA DISTRICT.

(Including the Ottawa Valley and the eastern portion of the Province, not elsewhere enumerated, south of latitude 46 deg.)

W. T. MACOUN, Horticulturist, Central Experimental Farm, Ottawa.

Flemish in most favored parts.

DESCRIPTION OF VARIETIES.

ANSAULT.

Claimed to be a good general-purpose pear for home uses, but not as yet widely tested.

ORIGIN: France.

TREE: An early and abundant bearer.

FRUIT: size, medium; roundish oblate pyriform; skin, green, yellowing at maturity, mostly covered with russet; stem, ½ inch to 1 inch long, in a small irregular, often oblique, cavity; calyx, small, open in an abrupt, deep basin.

FLESH. color, creamy white; texture, tender, fine grained, buttery, juicy; flavor, agreeable, aromatic, very pleasant.

QUALITY: fair for all purposes.

VALUE: home market, second class; not grown to any extent.

SEASON: September.

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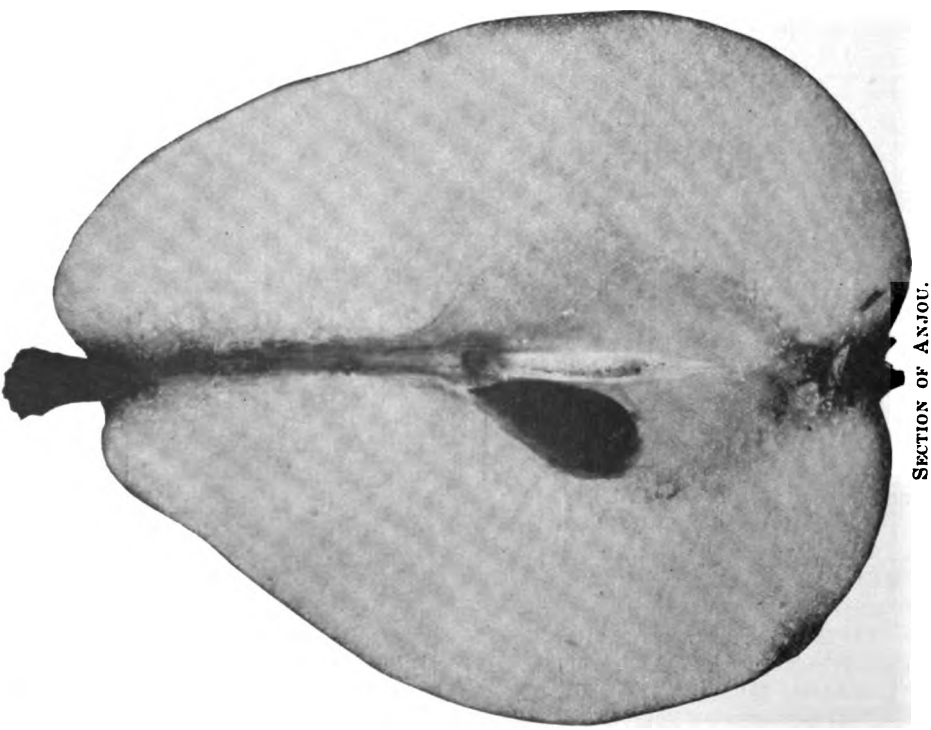
ANJOU.



SECTION OF ANJOU.

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ANJOU. (*Beurre d'Anjou.*)

A fine market pear, succeeding admirably on quince roots, but on pear roots the tree is not so productive, nor the fruit so large. Its fine size, and melting, buttery texture, make it a favorite market pear for the month of December, and past experience proves it a desirable variety to export to Great Britain.

ORIGIN: Louvain, Belgium, about 1823; named Ne Plus Meuris, after Father Meuris.

TREE: a vigorous, strong grower; productiveness, scarcely first rate, even on the quince, third rate on the pear.

FRUIT: large; form, obovate, blunt pyriform; skin, thick, yellow at maturity, with greenish patches and brown dots, brownish red on sunny side; stem, scarcely half an inch long, stout and fleshy; calyx, open, set in a shallow basin; core, small; seeds, few, if any.

FLESH: white; texture, fine grained, buttery, melting; flavor, pleasant, perfumed, not very sweet.

QUALITY: table or cooking, good.

VALUE: home market, first class; foreign market, first class.

SEASON: November.

ADAPTATION: fairly general in Ontario.

BAUDRY.

A promising new winter pear, which has been fruiting at our Maplehurst station as a dwarf.

FRUIT: size, large; form, oblong, pyriform; color, yellowish green, with russet patches.

FLESH: color, yellow; texture, tender, but gritty at the core; flavor, very good.

QUALITY: very good for dessert and cooking.

VALUE: second class for market.

SEASON: late winter.

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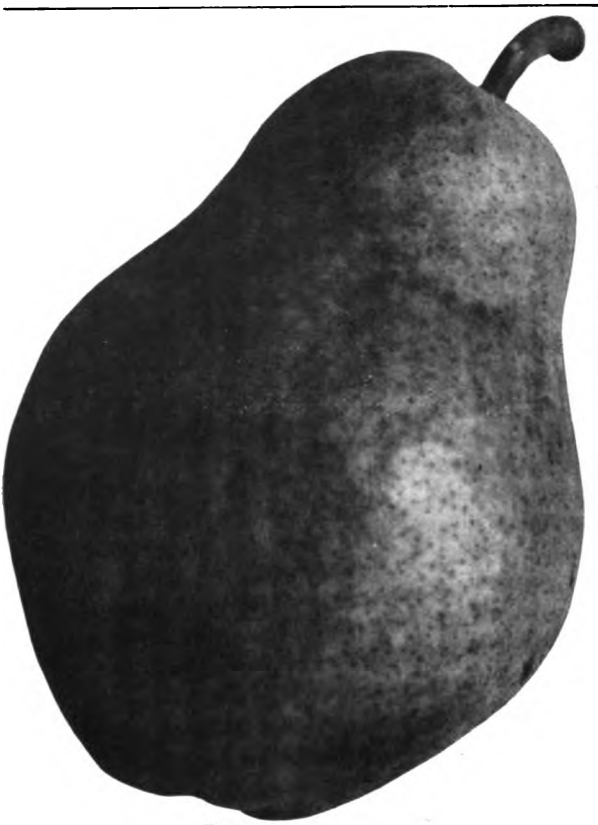


BARTLETT.

BARTLETT. (*Williams.*)

No pear of the same season equals in popularity the Bartlett, for either dessert or canning. Indeed, while it is in the market, no other pear compares with it in price or brings as much profit to the grower. Of late, large orchards of this one variety have been planted in Canada, and there is a growing demand for it in the North-west Provinces. With trustworthy cold storage, it may be exported to Great Britain with profit.

ORIGIN: Berkshire, England, 1770, propagated by Mr. Williams, near London. Introduced into America and disseminated by Enoch Bartlett, of Boston.

TREE: healthy, vigorous, half-hardy, overcomes blight better than most varieties, very productive.

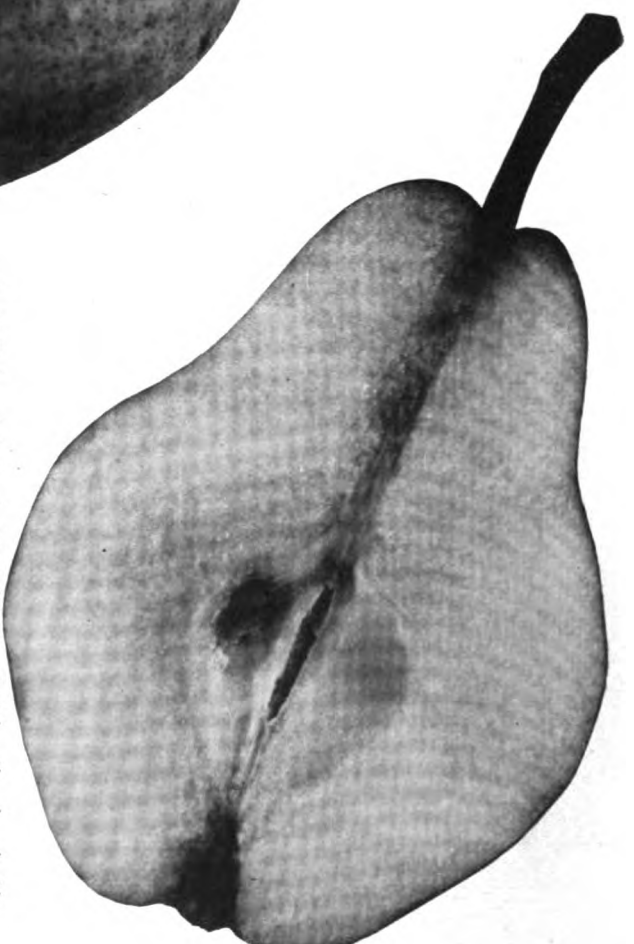
FRUIT: large, oblong, obtuse, pyriform; color, yellow, with very numerous minute brown dots, often russetted at the apex; stem, 1¼ inches long, in a small, irregular cavity; calyx, open in an irregular basin.

FLESH: creamy white, fine grained, very buttery and juicy; flavor, sweet, perfumed, vinous.

QUALITY: dessert, the most profitable variety.

SEASON: early to mid September.

ADAPTATION: succeeds admirably in southern Ontario, and as far north as the Bay of Quinte.



SECTION OF BARTLETT.

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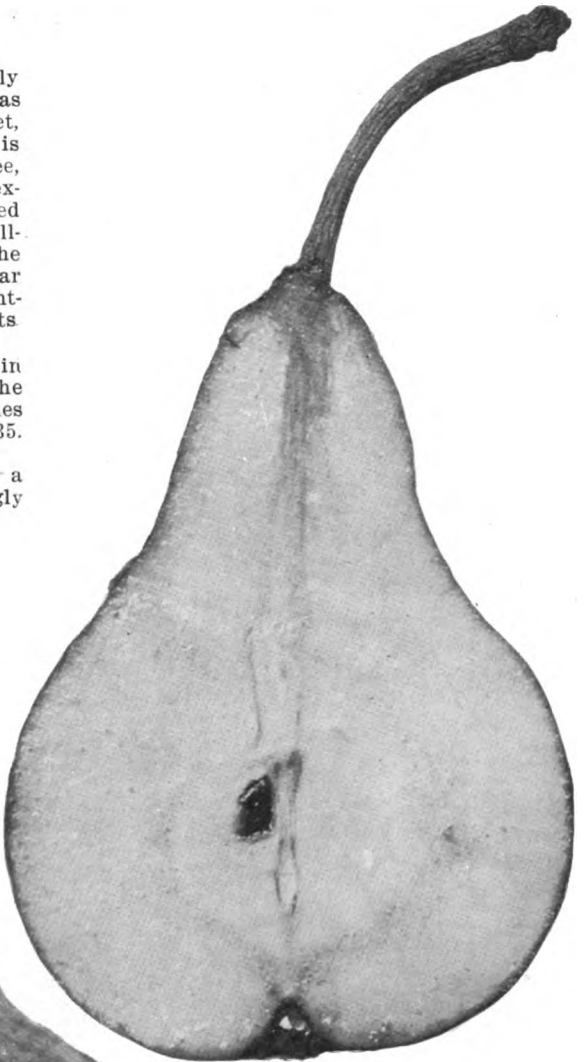
BOSC. (*Beurre Bosc, Downing.*)

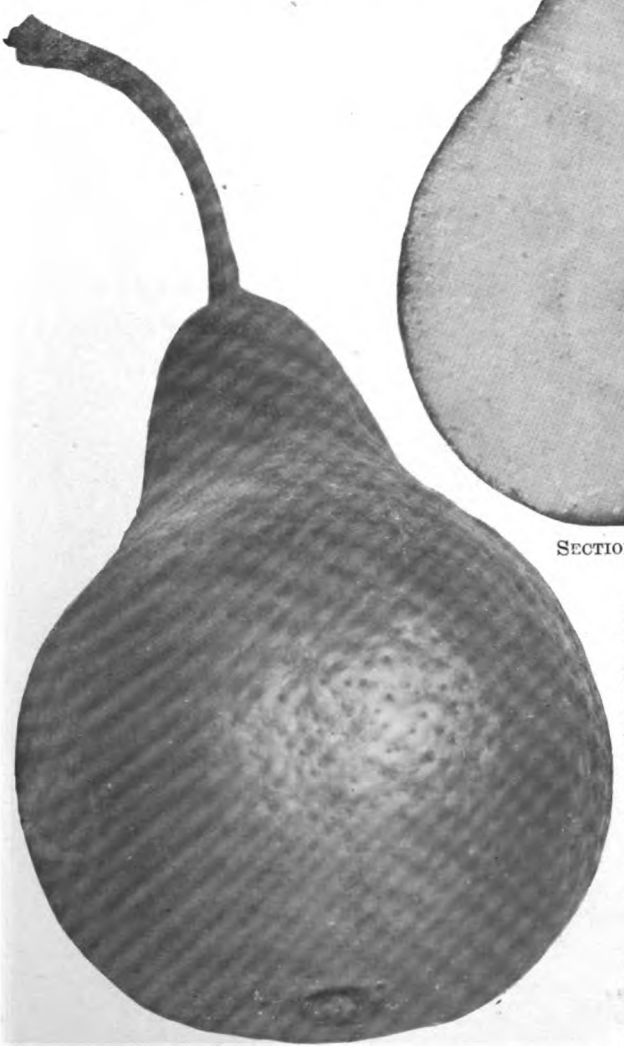
The Bosc pear is not as widely known among cultivators in Canada as its merits deserve. Though a russet, it yellows as it ripens; the pear is large in size, and uniform on the tree, as if thinned purposely; and the texture is such that it can be exported in fine condition. In quality, a well-grown Bosc is first class. On the whole, we would place this pear among the valuable kinds for planting for export to the foreign markets.

ORIGIN: a chance seedling, found in France, and dedicated to M. Bosc, the eminent director of the Jardin des Plantes at Paris, about the year 1835.

TREE: a vigorous grower, and a regular bearer, carrying its fruit singly and not in clusters, as is the habit of some varieties.



SECTION OF BOSC.



Bosc.

FRUIT: large, elongated acute pyriform, covered with slight indentations; color, greenish, yellow ground, nearly covered with cinnamon russett; stalk, 1½ to 2 inches long, stout and usually curved, inserted without a cavity; calyx, open in a shallow basin.

FLESH: white; texture, fine, breaking, juicy; flavor, sweet, rich, delicious.

QUALITY: first class for dessert.

VALUE: first class for either home or foreign markets.

SEASON: October.

ADAPTATION: southern Ontario and as far north as Bay of Quinte.

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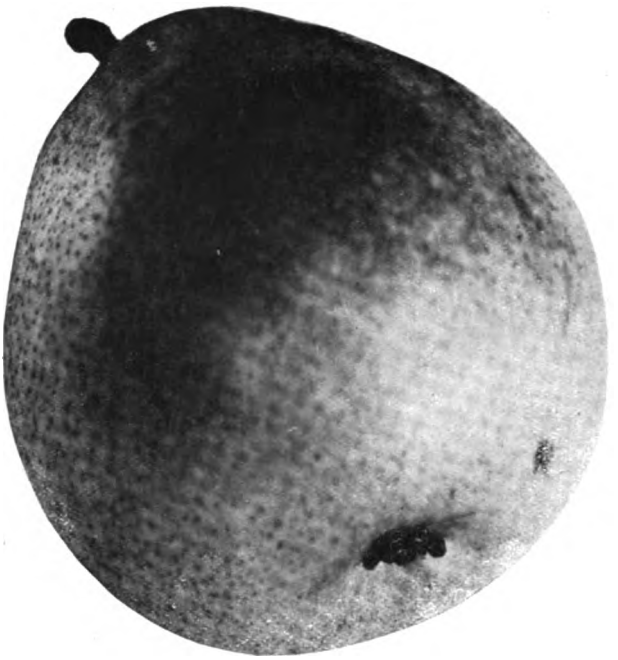
BOUSSOCK. (*Doyenne Boussock.*)



BOUSSOCK.

Described by Downing as a profitable market sort, but our experience in Canada would lead us to give it a second place, when compared with the Bartlett or the Anjou. The tree is a good grower and productive, and the fruit is uniformly large, but it is second class in quality, unless eaten just at the proper stage of ripeness, and the tree is inclined to drop its fruit too soon.

ORIGIN: Belgium.

TREE: succeeds best as a standard; vigorous, hardy and very productive.

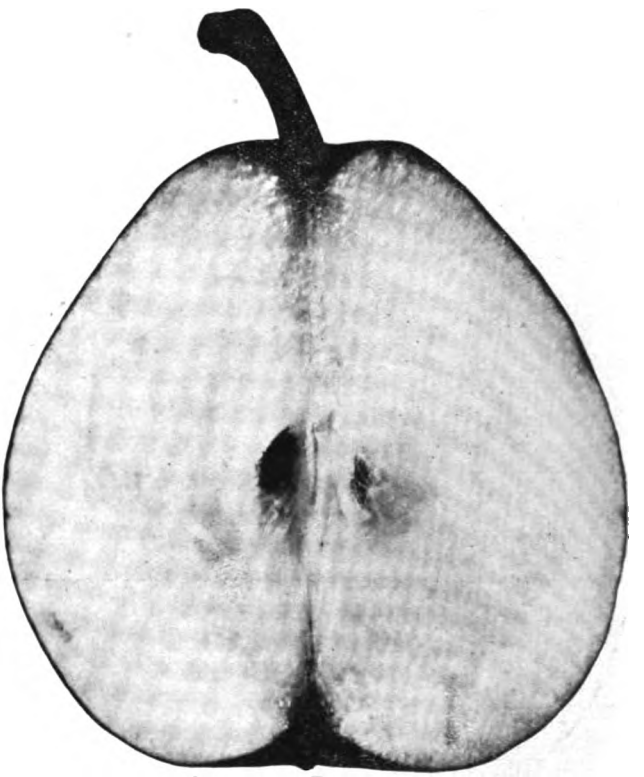
FRUIT: large; form, roundish, obovate; skin, yellow, with dull red cheek, and numerous rough dots; stalk, fleshy, stout, 1 to 1¼ inches in length, in a round cavity; calyx, open, in a shallow russeted depression.

FLESH: white; texture, tender, juicy, if gathered at the right season; flavor, sweet and agreeable.

QUALITY: dessert, very good.

VALUE: near markets, first class.

SEASON: September.



SECTION OF BOUSSOCK.

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BRANDYWINE.

A good general dessert pear, but not much grown for market in Ontario, being so nearly of the same season as Bartlett.

ORIGIN: chance seedling found on the banks of the Brandywine River, Delaware County, Pennsylvania. The original tree fruited for the first time in 1820.

TREE: vigorous; upright; fairly productive; succeeds best on the quince.

FRUIT: size, medium; form, conic pyriform; color of skin, greenish-yellow, with blush on the sunny side, and dotted and sprinkled with russet; stem, ¾ to 1½ inches long, fleshy at insertion which is surrounded by folds; calyx, open in a smooth, shallow basin.

FLESH: color, white; texture, tender, melting, very juicy; flavor, sweet, vinous, aromatic.

QUALITY: dessert, very good.

VALUE: market, second class.

SEASON: early September.

BUFFUM.

Formerly this pear was much in favor as a profitable orchard variety, because of its productiveness and the wonderful hardiness and vitality of the tree, but of late years it is much less in favor with pear growers on account of its small size and ordinary quality. Some trees of this variety at Maplehurst, forty years planted, have never shown the slightest tendency to blight, and have attained a great height, more resembling Lombardy poplars than pear trees.

ORIGIN: Rhode Island.

TREE: remarkable for its vigorous, symmetrical, erect habit of growth; it is regularly and fairly productive, but, unless gathered early, the fruit drops badly; not subject to blight.

FRUIT: medium size, obovate, slight oblong; skin, rough, yellow at maturity, with bright or dull red or russet on sunny side; dots, small, brown; stalk, ¾ inch long in a small cavity; segments of calyx small, in a small plaited basin.

FLESH: color, yellowish-white; texture, crisp, not fine, not juicy; flavor, sweet and pleasant.

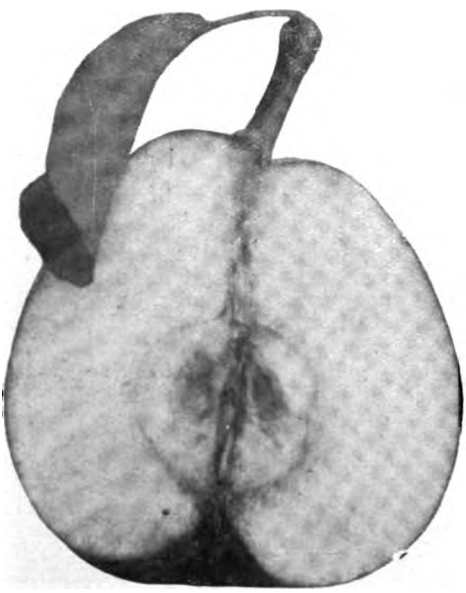
QUALITY: dessert, fair; cooking, fair.

VALUE: home and distant markets, second class.

SEASON: September.

ADAPTATION: stated to be hardy in Bruce and Huron Counties; slightly tender in North Ontario County.

CHAMBERS.



CHAMBERS.

The Chambers pear has been grown at Maplehurst for about ten years on dwarf stock, and commends itself as a fine market variety the beginning of August, for it is of a good quality, fairly large, and the tree is productive.

ORIGIN: brought from Maryland to Kentucky by Judge Wm. Chambers.

TREE: moderately vigorous, very hardy, productive.

FRUIT: of medium size; form, obtuse, obovate, pyriform; color, pea green, turning yellow, when fully mature, with numerous brown and green dots, and reddish-brown cheek on sunny side; stalk, stout, 1 inch long, set on an angle in a flat cavity, often one shoulder prominent; calyx, small, half-open; seeds, few.

FLESH: white; texture, tender, fairly juicy; flavor, aromatic, sweet and pleasant.

QUALITY: good.

VALUE: for near market, first class.

SEASON: early August.

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CLAIRGEAU.

As a commercial pear, especially for a distant market, we know of no variety of the same season that is superior to this variety. Its large size, and the beautiful cheek which it takes on during the month of October, its excellent shipping and keeping qualities, all these combine to make it a profitable variety, and one that is easily grown, either as dwarf or standard. The quality is variable, according to the conditions of growth; in France, it is counted very good; in England, poor; with us, when well ripened, it is only good.

ORIGIN: Nantes, in France, with a gardener named Clairgeau, about 1838.

TREE: first class in vigor, hardiness and productiveness; wood, stout and upright in habit of growth; branches, numerous, grown as a dwarf can be trained to make a fine pyramid, but succeeds best as a standard; an early bearer.

FRUIT: large, one-sided, pyriform; skin, green, turning pale yellow at maturity, almost overspread with splashings and dots of russet, which completely cover it about the stock and the calyx; orange red on sunny side; stalk, ¾ inch long, stout, fleshy at the base, usually set at an angle with the axis; calyx, small, open, in a shallow, furrowed basin.

FLESH: white, coarse grained, juicy, with sweet, aromatic and vinous flavor.

VALUE: home or foreign market, first class.

QUALITY: cooking, good; dessert, good.

SEASON: October to November.

ADAPTATION: succeeds admirably as far north as Thornbury; and east as far as Prescott.

CLAPP. (*Clapp's Favorite.*)

The Clapp is a beautiful pear where well grown and well colored. It is also of good quality, so that it is well fitted to be a profitable market pear; with one fault, that it soon passes out of prime condition, and, if allowed to ripen on the trees, it will rot at the core. On this account the fruit must be gathered as soon as full grown and well colored, and shipped while firm.

ORIGIN: raised by Thaddeus Clapp, of Dorchester, Mass., U.S.

TREE: upright, vigorous grower, somewhat spreading, forming a symmetrical top; bears fruit of uniformly large size, pretty evenly distributed; productive; succeeds well as a dwarf on rich soil; very susceptible to blight.

FRUIT: very large, pyriform, obovate, usually symmetrical, sometimes with unequal sides; skin, pale green, changing to yellowish green, with dull red on sunny side, which becomes bright crimson at maturity, somewhat resembling the coloring of the well-known Louise; stalk, stout and fleshy, obliquely inserted without cavity; calyx, large, half open, in shallow basin.

FLESH: creamy white; texture, fine, tender, juicy, with very agreeable flavor; good to very good.

QUALITY: good for dessert and cooking.

VALUE: the most valuable of the early varieties of pears.

SEASON: August and September.

ADAPTATION: One of the hardiest pears.

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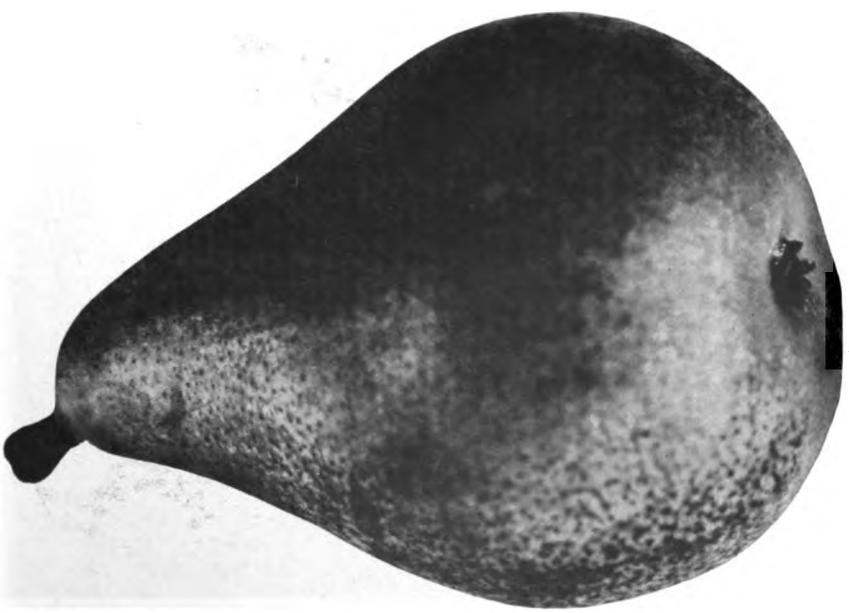
SECTION OF CLAIRGEAU.



CLAIRGEAU.

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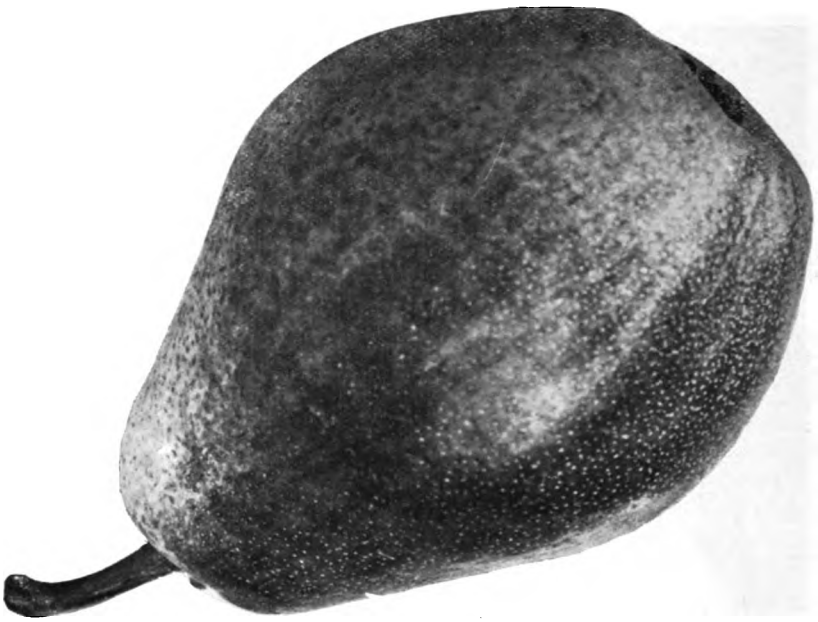
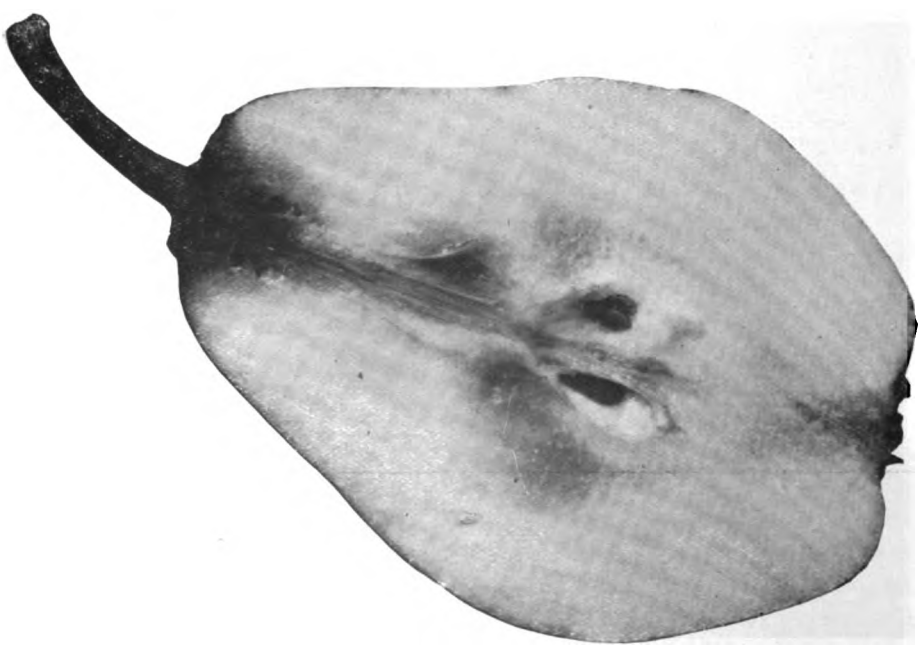


CLAPP.



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COMICE. (*Doyenne de Comice.*)

"Tree, large, upright. Fruit, large, roundish pyriform, or broad obtuse pyriform, cavity, shallow, often russeted; stalk, short, stout, inclined; basin, large, deep, uneven; calyx, small, open; color, greenish yellow, becoming clear yellow at maturity, often lightly shaded with crimson and fawn in the sun, and with light nettings and patches of russet and numerous russet dots; flesh, white, juicy, melting, a little buttery with a fine texture, and sweet, rich, sprightly and aromatic flavor; quality, good; season, October to November; quite productive." (*Report, Mich. Exp. Sta.*)

DEARBORN. (*Dearborn's Seedling.*)

Previous to the introduction of such choice early varieties as Chambers, Wilder, Giffard and Clapp, the Dearborn was highly commended. Downing calls it, "a very admirable early pear of first quality, succeeding Bloodgood, and preceding Bartlett;" but it is no longer to be commended for planting in the commercial orchard because of its small size. It is now considered only valuable in the garden of the amateur.

ORIGIN: at Boston, Mass., in 1818, by the Hon. H. G. S. Dearborn.

TREE: of moderate vigour; not subject to blight; very productive.

FRUIT: size, small, roundish obovate; skin, clear yellow, with small grey dots, smooth; stem, 1 to 1¼ inches long, inserted with little or no cavity; calyx, open in a shallow basin.

FLESH: creamy white; texture, tender, buttery, juicy; flavor, agreeable.

QUALITY: dessert, fair; cooking, good.

VALUE: market, third class.

SEASON: mid to end of August.

DEMPSEY.

The Dempsey was originated near Trenton, in Prince Edward County, by Mr. P. C. Dempsey, the late well-known Director of our Association for that district. It was produced from a seed of a Bartlett, fertilized with Duchess d'Angouleme. The fruit is firm

TREE: vigorous and productive.

FRUIT: large, oblong, obovate, pyriform; skin, smooth, yellowish-green, with brownish-red cheek in sun; stem, about 1 inch long, set in a fleshy base, and with almost no cavity; calyx, nearly closed in a moderately deep, uneven basin, core, small.

FLESH: white, fine grained, tender, almost melting, with sweet, delicious flavor.

SEASON: late October to November.

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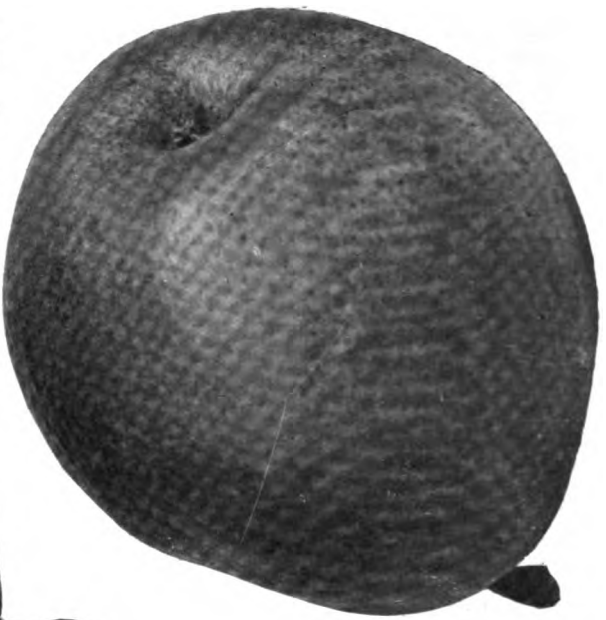
DIEL. (*Beurre Diel.*)

A pear of ordinary appearance as grown in Southern Ontario, but of such size and excellent quality that it deserves a place in every collection, whether for home use or market.

ORIGIN: a chance seedling near Brussels, Belgium, named in honor of Dr. Diel, a German pomologist.

TREE: very vigorous, hardy and productive.

FRUIT: large to very large; obovate; skin, pale green, turning yellow at maturity, with numerous large brown dots and patches of russet; stem, curved, stout, from 1 to 1¼ inches long, set in an open, uneven cavity; calyx, open, in a basin of moderate depth and not very regular.



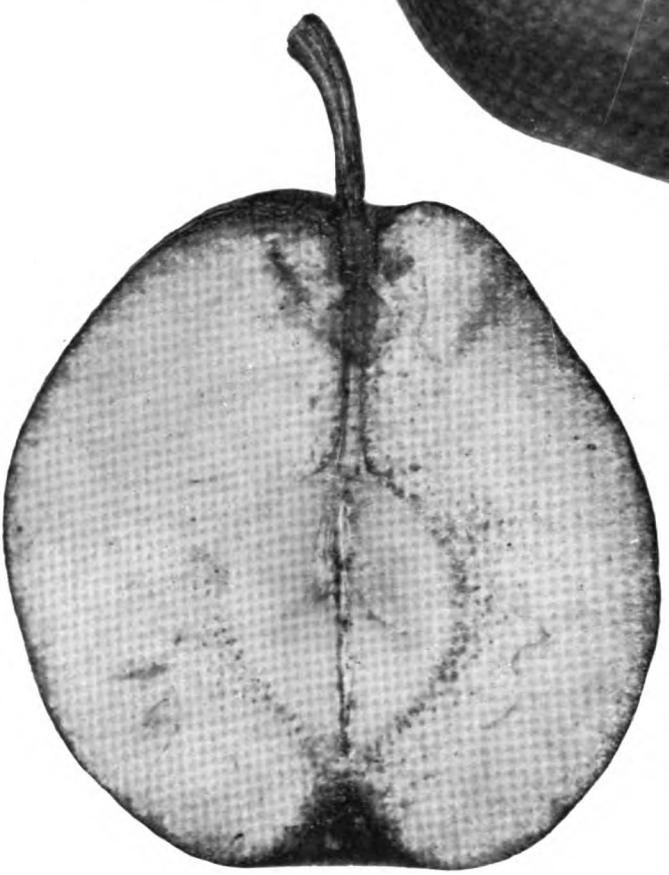
DIEL.

FLESH: cream color; texture, moderately fine, except at the core, juicy, buttery; flavor, aromatic, sweet and when well grown and well ripened, very delicious.

QUALITY: dessert, very good.

VALUE: home market, second class, because lacking in color; foreign market, possibly first class, because it carries well and has fine flavor, but not yet tested in this respect.

SEASON: November, just preceding the Lawrence.



SECTION OF DIEL.

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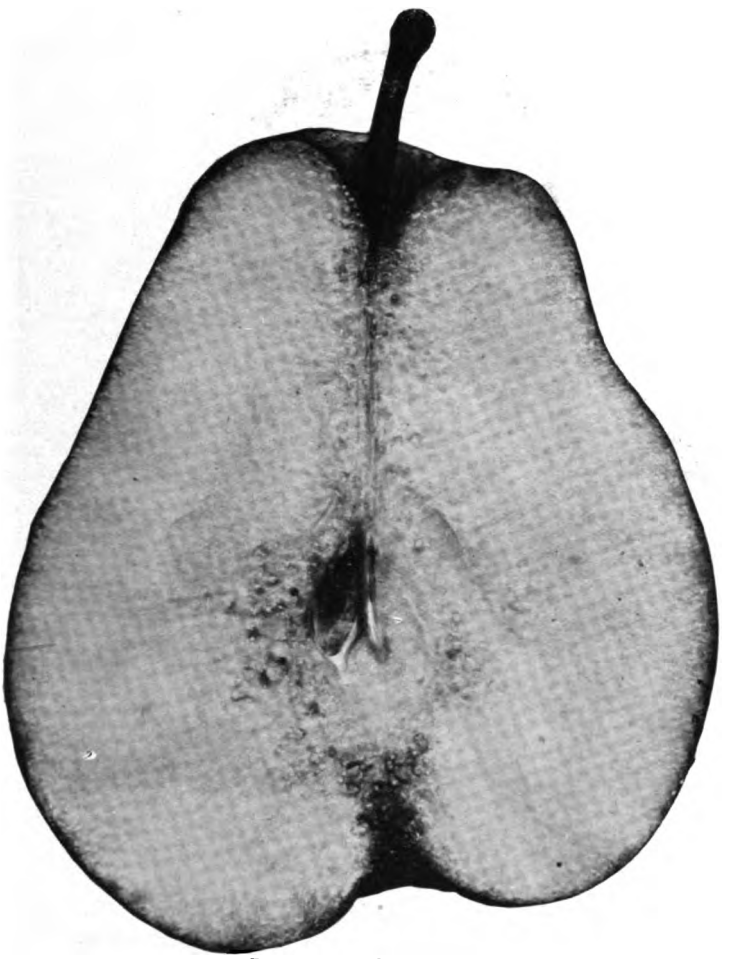
DROUARD. (*President Drouard.*)

"Large, roundish ovate, obtuse, rather irregular; color, yellow, with nettings and washings of russet; stalk, quite stout, inserted in a deep, narrow, irregular cavity; flesh, creamy white, tender, buttery, sweet, perfumed; good. An autumn variety much liked in Michigan and east of the lakes. Europe." (*American Horticultural Manual.*)

DUCHESS. (*Duchess d'Angouleme.*)



SECTION OF DUCHESS.

For many years this pear has been counted among the best and most profitable varieties in Ontario, especially when grown on quince stock, and, in consequence, has been largely planted. Prime samples are excellent stock for export, carried in cold storage. The fruit is often knotty from curculio stings.

ORIGIN: Angers, France, in 1812, a chance seedling. In 1820, Andusson, the propagator, sent a basket of the fruit to the Duchess d'Angoulême, who authorized him to bestow her title upon the pear as its name.

TREE: a strong grower, succeeds best on the quince; variable in productiveness: not subject to blight.

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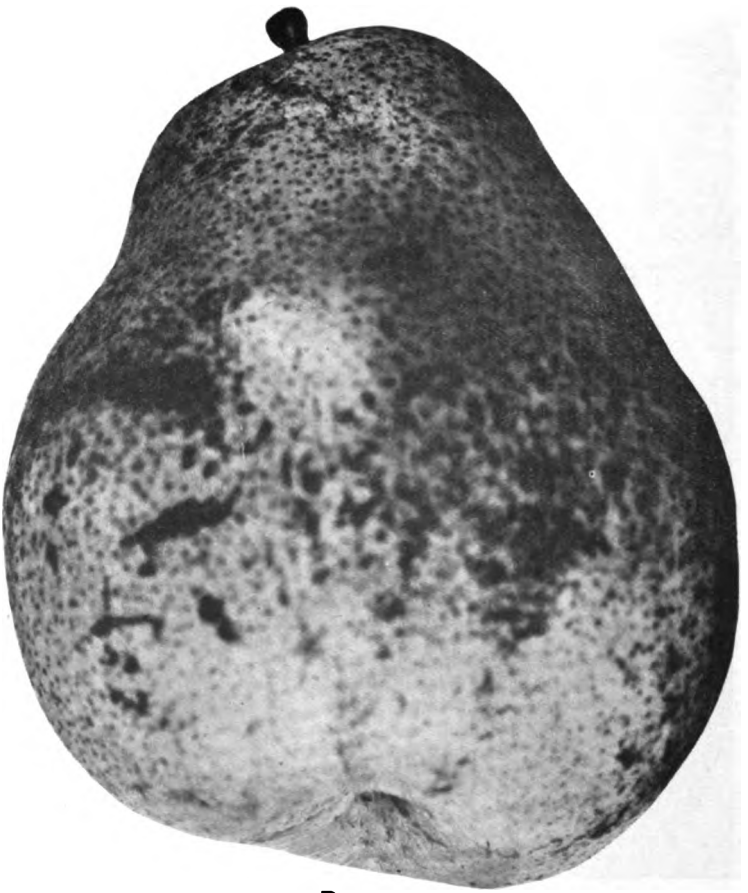
FRUIT: exceedingly variable in size, sometimes weighing a pound and a quarter; form, obovate, large at the base; surface, uneven, sometimes knobby; skin, light green, patched with russet, and numerous grey dots; stalk, stout, curved, 1 inch long, often swollen at point of attachment, deep set in an irregular cavity; calyx, small, closed, in an uneven, often russeted basin.

FLESH: white; texture, fine, when well grown, but often coarse-grained, melting, juicy and, when properly matured, of a sweet and very good flavor.



DUCHESS.

QUALITY: dessert, very good; cooking, good.

VALUE: first class for either home or foreign market. One of the best commercial pears as a dwarf.

SEASON: October and November.

ADAPTATION: hardy in southern Ontario, but only half hardy in Grey, Bruce and York.

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EASTER BEURRE.

Among the desirable pears to grow for export we must not overlook the Easter Beurre, which, though green and unattractive in appearance at time of harvesting, keeps well through the winter, is an excellent shipper, and is very good in quality. A warm climate and favorable soil seem to be necessary to its best development, and, accordingly, we find it planted for commercial purposes in the Californian pear orchards. On deep, rich sandy loam, in the southern parts of our Province, it succeeds well, either as a dwarf, or as a standard tree.

Although some writers have claimed that this pear originated in France, because some old trees were found near Laval, yet the majority agree that the variety originated in Belgium, at the old University town of Louvain. Van Mons, in his Album de Pomologie, in 1847, says, "This variety was found in the ancient gardens of Capucins, at Louvain, where the original tree still stood in the year 1825, under the name of Pastorale de Louvain."

In the old countries, much confusion has existed regarding the names of pears, and subsequently much difficulty exists in the identification of varieties; this pear, for example, is given no less than twenty-four different names in LeRoy's Dictionnaire de Pomologie, as, for example, Doyenne de Printemps, Canning, Beurre d'Hiver, etc., the last being adopted by LeRoy; while Hogg, of England, and Downing, of America, both adopt the name so well known to us, Easter Beurre.

TREE: fairly vigorous, upright and productive, and may be grown either as a dwarf or as a standard tree; if, as a standard, it needs good, rich soil and a warm climate for the best success. In Great Britain, it does not seem to succeed so well as in Canada, for Hogg says it frequently happens that this delicious pear is of an indifferent and insipid flavor, which is caused by the unfavorable soil; and Blackmore, of Teddington, says, "It cracks in spots and is seldom very good." Our experience with it, as grown on a dwarf tree, is favorable.

FRUIT: above medium size, irregular obovate; skin, pale green at harvesting time, yellowing somewhat toward maturity, with numerous russet dots, russet patches around the stem and calyx, and often a brownish cheek; stem, about 1 inch long, stout, swollen at the base, set in a narrow, deep cavity; calyx, small, closed, set in a much plaited basin of moderate depth.

FLESH: white, fine in texture, melting and juicy; flavor, sweet, rich and agreeable.

QUALITY: dessert, good.

VALUE: export, first class.

SEASON: mid to late winter.

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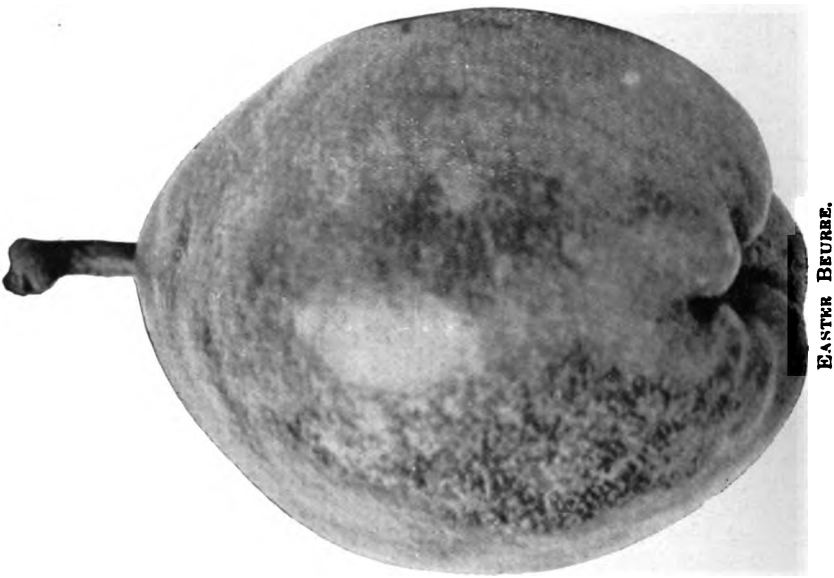
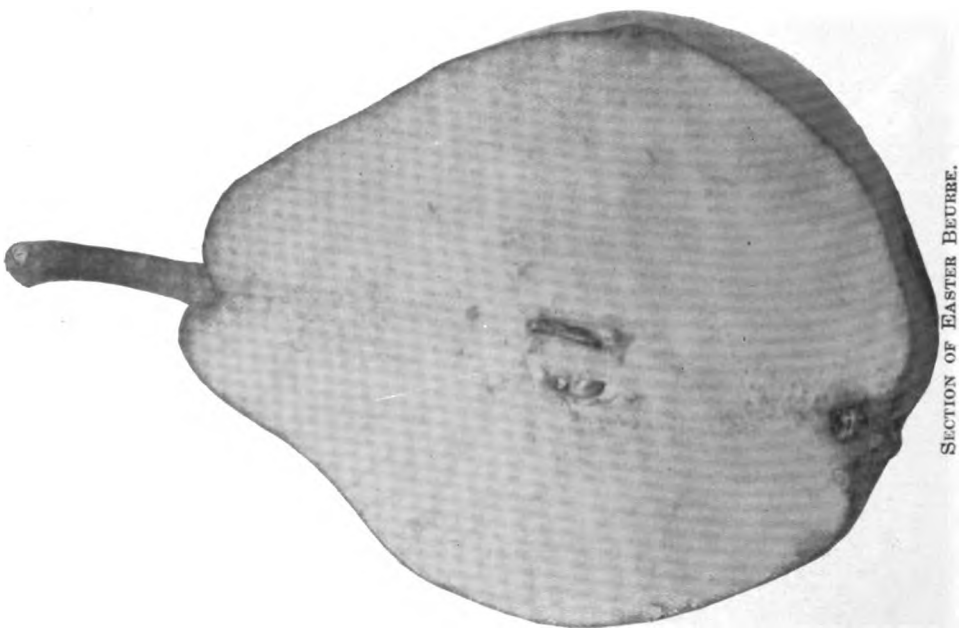


EASTER BEURRE.



SECTION OF EASTER BEURRE.

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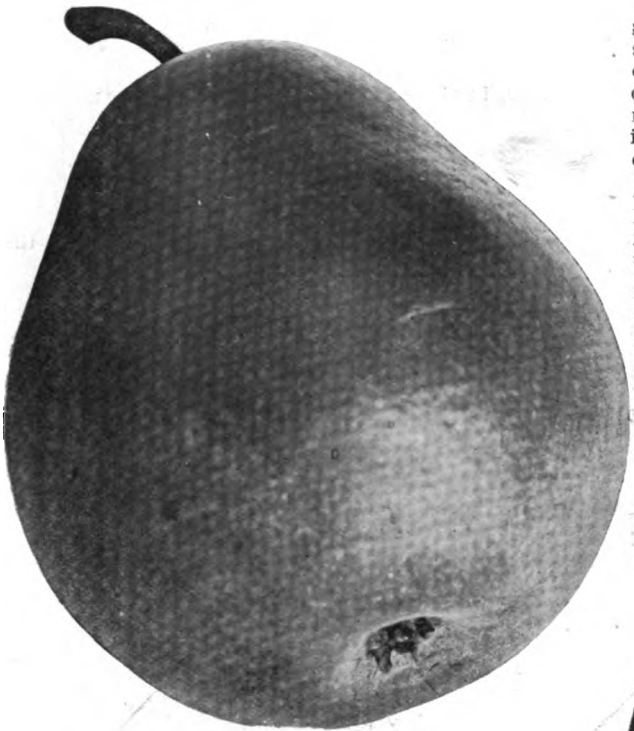
FLEMISH BEAUTY. (*Feodant des Bois of LeRoy.*)



FLEMISH BEAUTY.

A variety that has been a great favorite in Europe ever since the beginning of the eighteenth century, as is evidenced by the thirty-five synonyms which have been given it, as shown in "Dictionnaire de Pomologie," by Andre LeRoy. This and the Bartlett were among the first imported varieties of pears planted in Ontario, and it has been widely tested. In the northern sections, where it succeeds, it is a most popular variety, but in southern Ontario it has been of late so subject to scab and cracking of the fruit, that it has lost favor with growers, notwithstanding its excellent quality.

ORIGIN: discovered by Van Mons about the year 1810 in Eastern Flanders, and distributed among his friends.

TREE: first class in hardiness; almost first in productiveness; an early bearer.

FRUIT: large; form, obovate, obtuse, pyriform; skin, light yellow, when ripe, with frequent patches of brownish red on sunny side, with scattered minute dots; stalk, 1 to 1½ inches long, set in a narrow, deep cavity; calyx, open, segments short, in a small round basin.

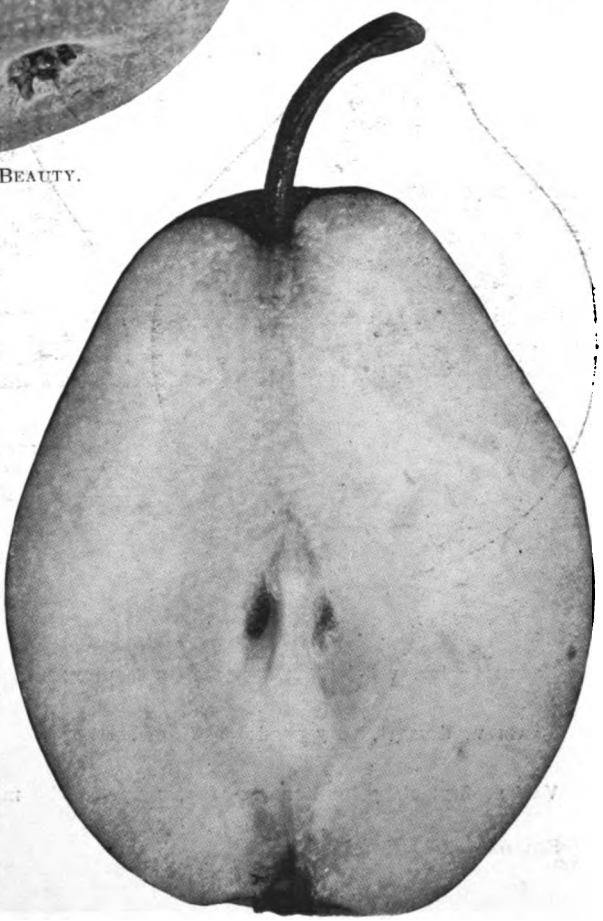
FLESH: creamy white, melting, buttery, juicy; flavor, rich, sugary, delicious.

QUALITY: first class.

VALUE: first class where well grown.

SEASON: mid to late September; should be gathered before quite ripe or it will drop and waste.

ADAPTATION: quite general: probably the hardiest good pear.



SECTION OF FLEMISH BEAUTY.

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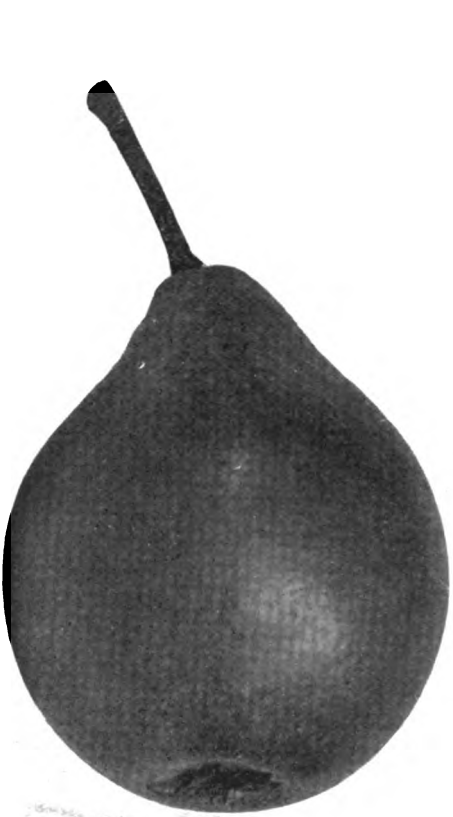
GIFFARD. (*Beurre Giffard.*)

A very desirable commercial pear for the home market.

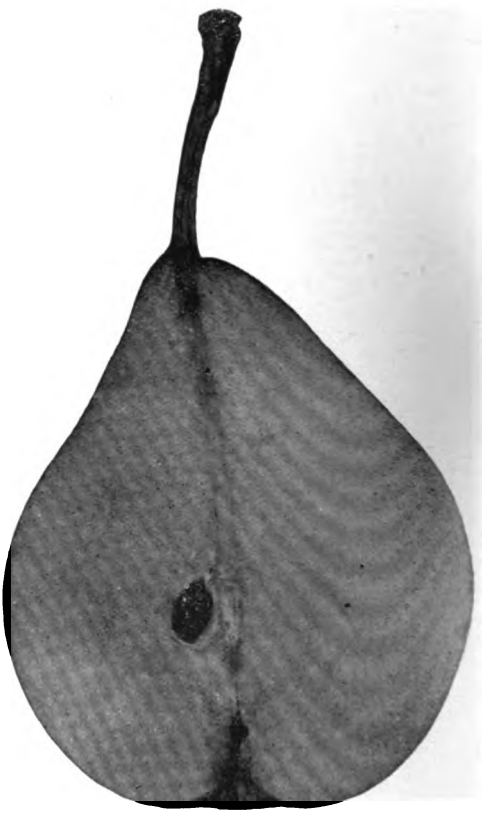
ORIGIN: a chance seedling about 1840, in the garden of M. Giffard, Angers, France.

TREE: fairly vigorous; a straggling grower; healthy; fairly productive.

FRUIT: size, medium to large; form, pyriform conical; color, light green, with red dots and marbling of red on the sunny side; stem, 1 inch long, stout, swollen at the base, set obliquely; calyx, half closed, in a small, shallow basin.



GIFFARD.



SECTION OF GIFFARD.

FLESH: color, white; texture, melting, juicy; flavor, vinous, perfumed.

QUALITY: dessert, very good; cooking, best.

VALUE: first class for home market. One of the most profitable of the early pears.

SEASON: early to mid August.

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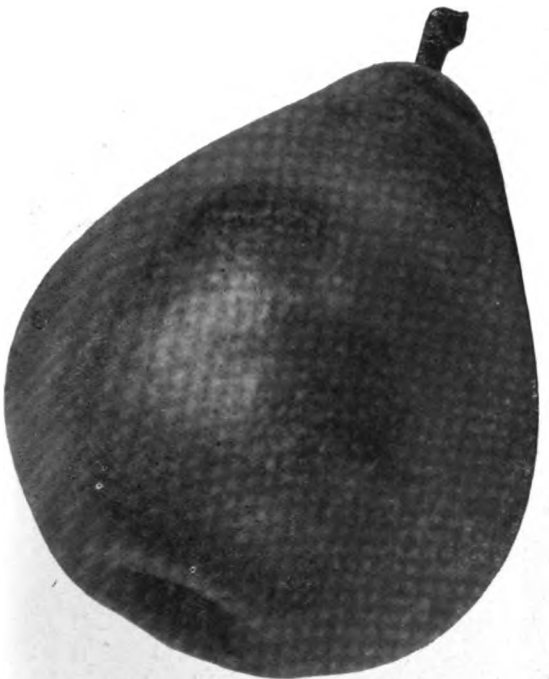
GOODALE.

A very good late fall pear; promising as a market variety.

ORIGIN: seedling raised by F. Goodale, Saco, Maine.

TREE: very vigorous and hardy and uniformly productive.

FRUIT: large, obovate obtuse pyriform; color, green, yellowing at maturity, with crimson cheek, some russet patches, and some small brown dots; stem, about 5/8 of an inch long, set in an inclined cavity; calyx, small, closed, in a small, rather deep, basin.



GOODALE.

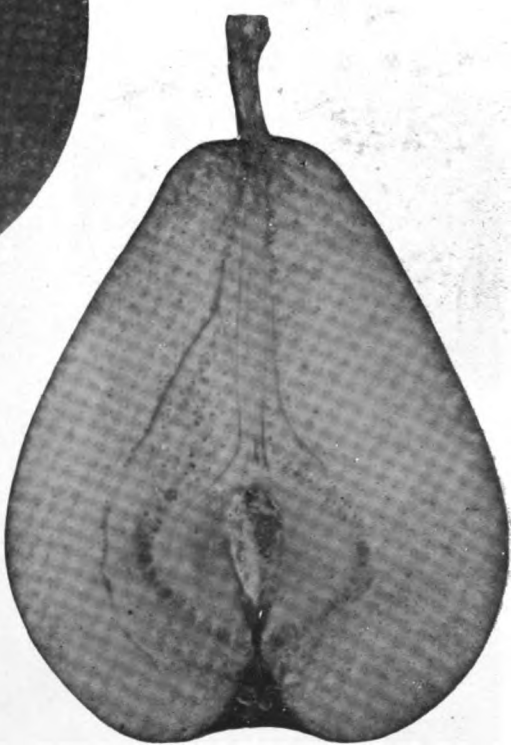
FLESH: color, white; texture, fine, juicy, granular at core; flavor, sweet, pleasant, perfumed.

QUALITY: dessert, fair.

VALUE: market, first class.

SEASON: October.

ADAPTATION: succeeds as far east as Bay of Quinte District.



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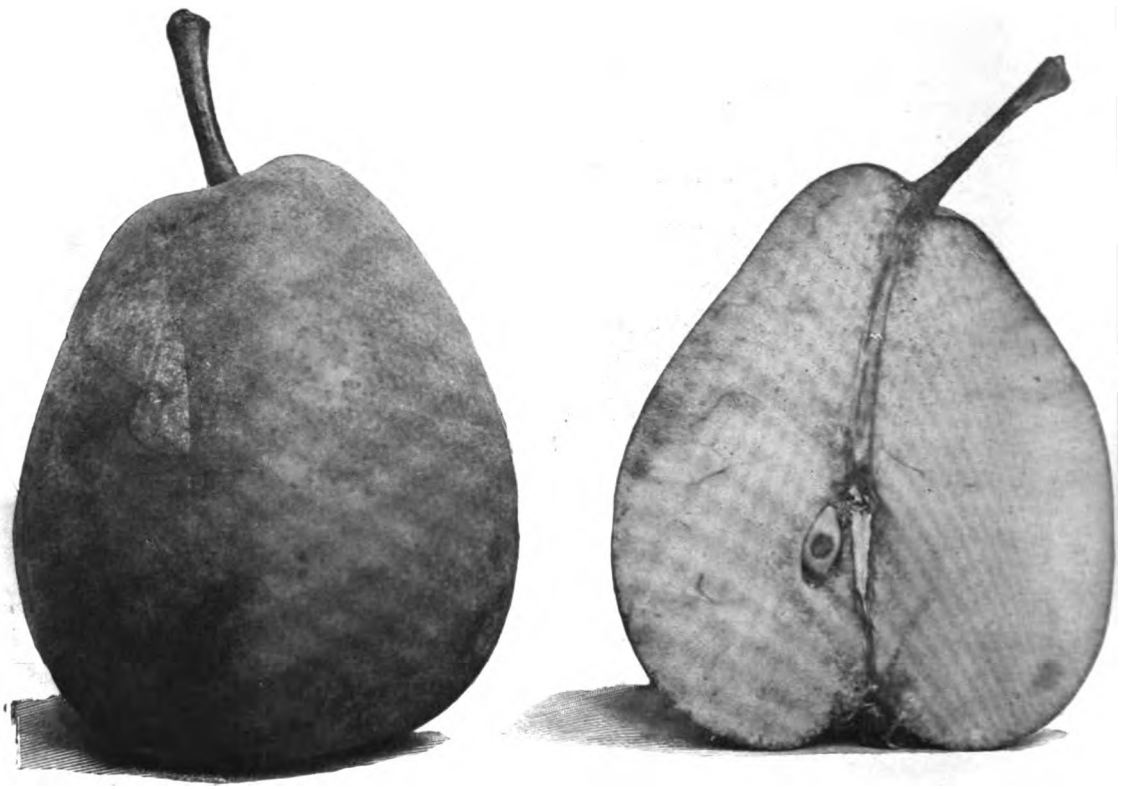
HARDY. (*Beurre Hardy.*)

A good variety for the month of October, for both home use and market.

ORIGIN: Boulogne, France, dedicated to M. Hardy, director of the gardens at Luxembourg.

TREE: fairly vigorous and productive, and forms a fine symmetrical tree, especially when grown on the quince. The fruit is uniform in size and the skin is a bright, clear russet.



HARDY.

FRUIT: medium size, form, obovate, obtuse pyriform, of smooth, regular outline; skin, yellowish green, with numerous russet dots and covered with light brown russet, especially at the ends; stem, about 1 inch in length, stout, with fold at the base, and inserted obliquely in a small depression; calyx, large, open, in a shallow basin; flesh, white, fine grained, buttery, juicy, with rich aromatic flavor.

QUALITY: dessert, very good; cooking, good.

VALUE: home market, first class.

SEASON: October.

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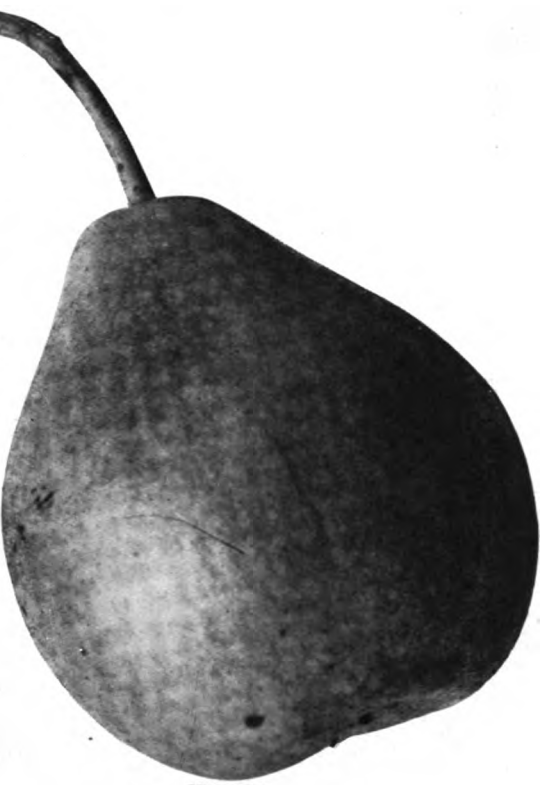
HOWELL.

A good export pear for southern Ontario. Its vigor of tree, regularity of bearing, clear skin, and good size and quality make it a desirable variety for the commercial orchard.

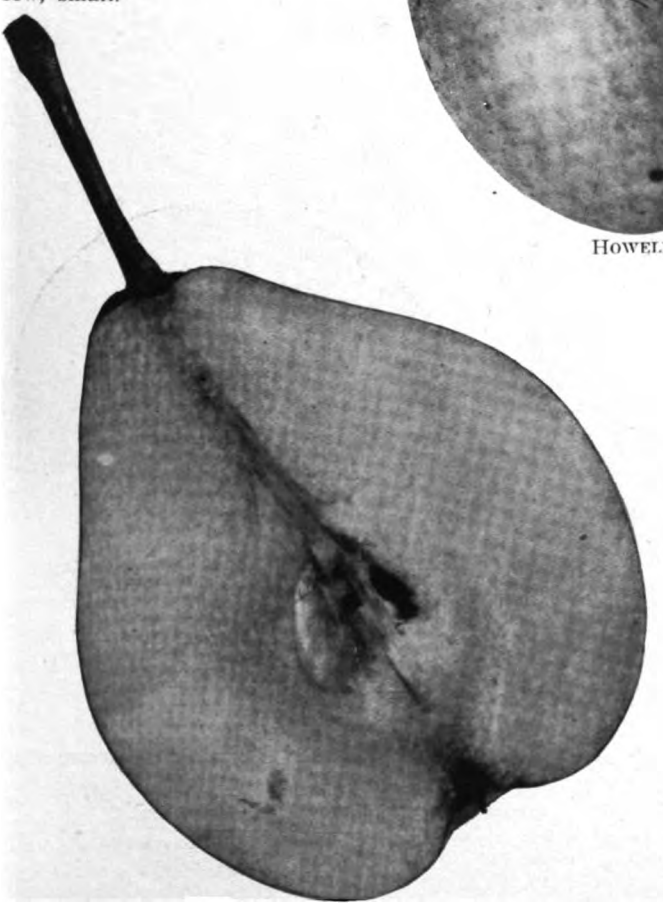
ORIGIN: New Haven, Conn. Named after the originator, Thomas Howell.

TREE: upright, healthy and vigorous, an early bearer, productive.

FRUIT: large, obovate pyriform; skin, yellowish green, waxen reddish dots on sunny side, russet dots in shade; stem, 1¾ inches long, set on an acute base, without cavity, sometimes lipped; calyx, partly open in a deep russeted basin; core, small; seeds, few, small.



HOWELL.



SECTION OF HOWELL.

FLESH: creamy white juicy, melting, granular near the core; flavor, agreeable, vinous; a little tart.

VALUE: first class for all markets.

SEASON: mid September to mid October.

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HOOSIC.

This promises to be an excellent commercial variety, with one fault, viz., its short season.

ORIGIN: seedling from Hacon's Incomparable, by Asahel Foote, of Williamstown, Mass.

TREE: on quince stock, healthy, vigorous and productive.

FRUIT: size, large to very large; form, obtuse pyriform, somewhat one-sided; skin, yellow, with light red in sun, and with russet dots; stem, 1¼ inches long, stout, curved, set in a small irregular cavity; calyx, small, open, set in a broad, uneven basin.

FLESH: white; texture, tender, fine and moderately juicy; flavor, rich, perfumed.

QUALITY: good for all purposes.

VALUE: first class for near market.

Grown at Maplehurst, as a dwarf, this pear has given the greatest satisfaction; and, only that its season is rather short, it would be commended as an export variety.

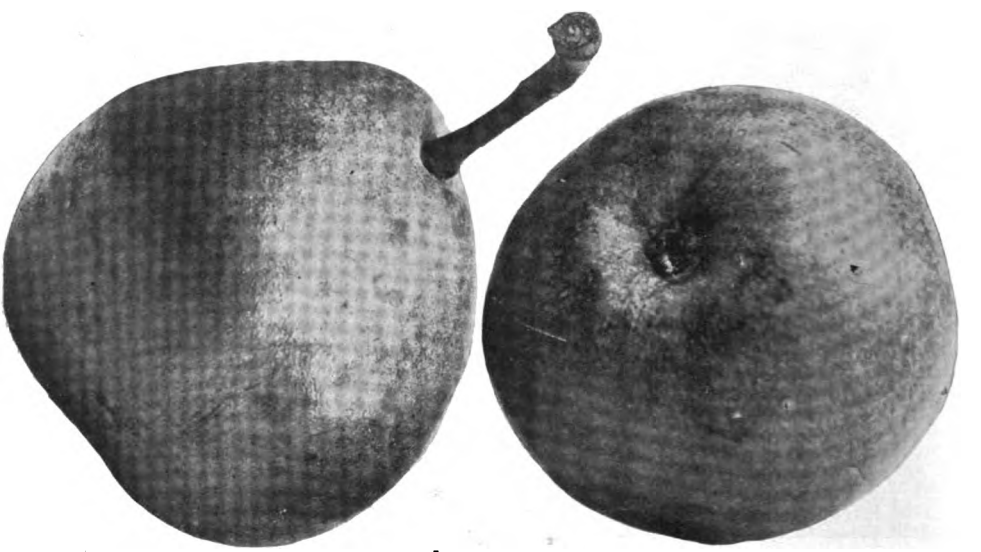
SEASON: late September.

JOSEPHINE. (*Josephine de Malines.*)

An excellent winter pear.

ORIGIN: Belgium.

TREE: succeeds well on the quince stock; productive.



JOSEPHINE.

FRUIT: size, medium, oblate, conical; color, yellowish, with small dots; stem, often two inches long in a slight cavity; basin, large.

FLESH: color, yellowish white; texture, buttery; flavor, rich and peculiar.

QUALITY: dessert, very good.

VALUE: market, second class.

SEASON: mid winter.

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KIEFFER.

There is perhaps no pear about which a greater diversity of opinion exists; some fruit men condemning it because of its lack of quality, and others insisting that its beauty of appearance, its enormous productiveness, and its wonderful health and vigor of tree make it a profitable market variety, and that when properly grown and ripened it is quite a desirable kind, especially for cooking. Certainly the tree surpasses every variety in our collection for productiveness and vigor of growth; while the fruit is always uniformly perfect in form, free from blemishes, and, when the tree is cultivated and manured, large in size.

ORIGIN: by Peter Kieffer, Roxbury, Pa., a seedling of Chinese Sand pear.

KIEFFER.

TREE: wonderfully vigorous and healthy; an early and extraordinary bearer.

FRUIT: medium to large; form, ovate, tapering at both ends, widest at middle, and narrowest towards stem; skin, light golden yellow, with bright cheek, and very numerous brown russet dots; stalk, one inch long, fairly stout, in a one-sided cavity; calyx, half open, in a medium sized irregular basin.

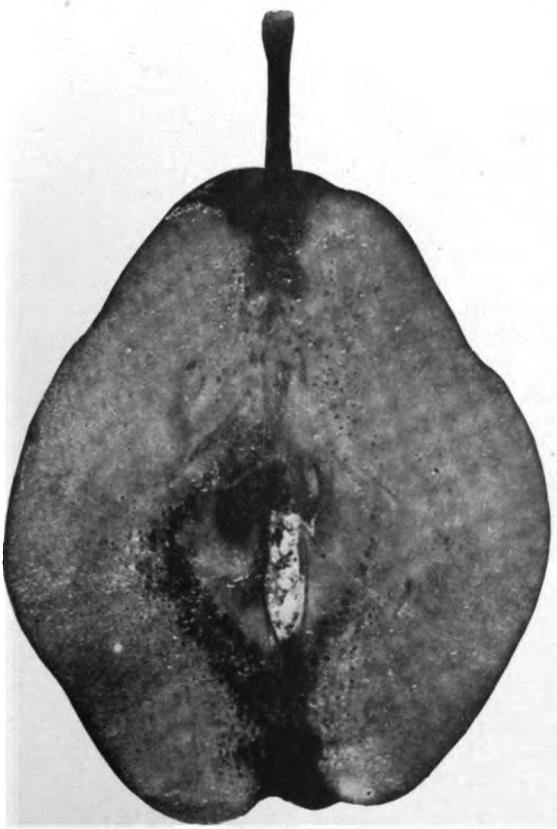
FLESH: yellowish white; texture, half tender, half melting, not very fine, juicy; flavor, moderately sweet, poor.

QUALITY: dessert, very poor; for cooking, good; valuable for canning.

VALUE: second class for all markets. This variety must be planted on good soils and highly cultivated and fertilized.

SEASON: October to January.

ADAPTATION: very general.



SECTION OF KIEFFER.

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KOONCE.

Ordinary in its appearance, and only medium in size, but on account of the productiveness of the tree, it is considerably planted in Illinois for kitchen and market.

ORIGIN: Illinois.

TREE: hardy, healthy and productive.

FRUIT: medium in size; form, obovate pyriform; color of skin, greenish yellow, with small russet dots; stem, stout, 1 inch long, inserted in a medium-sized, shallow cavity.

FLESH: white; texture, granular; flavor, poor.

QUALITY: dessert, poor; cooking, fair.

VALUE: for market, second class.

SEASON: early October.

LAWSON. (*Comet.*)

The most beautiful pear of its season, which is about the middle of August, but inclined to rot at core and become mealy, if left hanging too long. Its flavor is disappointing, so that, in spite of its beauty, it is useless as a dessert pear. It has been widely advertised and too highly praised. In some parts, it is grown as a cooking pear for home markets. For distant markets, it is useless, because too tender in flesh.

ORIGIN: on the farm of Mr. Lawson, in New York State, about the year 1800, judging from the appearance of the original tree, which was still standing in the year 1900. Quite recently, it was introduced to the public by Mr. Collins, under the name Comet, by reason of its bright red color.

TREE: tender, vigorous; fairly productive; succeeds on the quince.

FRUIT: medium to large; obovate, almost pyriform; color, yellow, shaded and obscurely streaked with bright red on the sunny sides, with a few small brown dots; stem, 1½ inches long, with fleshy protuberance at point of insertion, inclined; calyx, half open in a large irregular basin.

FLESH: color, creamy white, coarse grained, mealy when ripe, inclined to rot at the core; flavor, sweet, fairly good.

QUALITY: dessert, good; cooking, good.

VALUE: market, second class.

SEASON: early to mid August.

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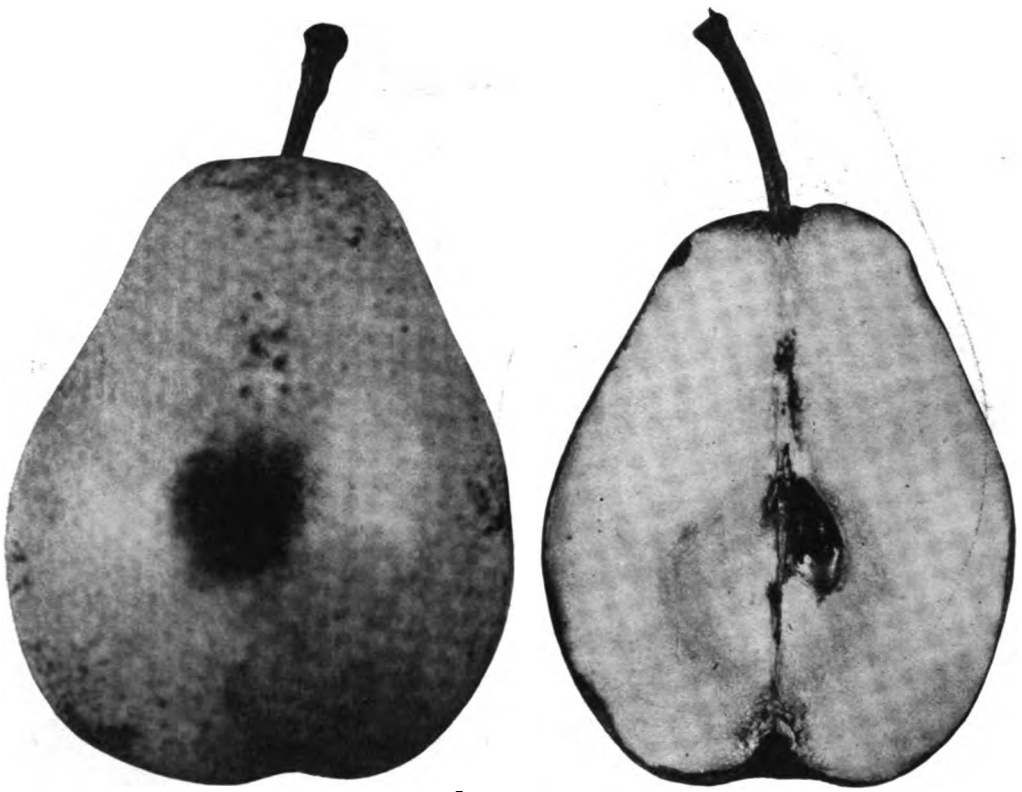
LAWRENCE.

Probably the best dessert pear for use in early winter.

ORIGIN: Flushing, Long Island, according to Downing; New York State, according to Catalogue, American Pom. Soc.

TREE: a moderate grower; an early bearer; moderately productive.

FRUIT: size, medium to large; form, obovate, obtuse pyriform; color, lemon yellow, with numerous small dots; stem, one inch long in a shallow cavity; calyx, open in a small, five-humped basin.



LAWRENCE.

FLESH: color, yellowish white; texture, buttery and juicy; flavor, sweet, rich, aromatic, very excellent.

QUALITY: dessert, best; cooking, good.

VALUE: market, second rate.

SEASON: December.

ADAPTATION: one of the hardy pears.

LE CONTE.

An American pear grown for market in the Southern States. It is not considered profitable in Ontario.

ORIGIN: a Chinese seedling.

TREE: vigorous; productive; apparently not subject to blight.

FRUIT: large; form, oblong, pyriform, turbinate; color, yellow, often with slight touch of red on sunny side; skin, free from blemishes, and not subject to scab.

FLESH: white; texture, tender; flavor, sweet, perfumed, ordinary.

QUALITY: dessert, poor; cooking, fair.

VALUE: second class for market; very similar to Kieffer, but not as highly colored.

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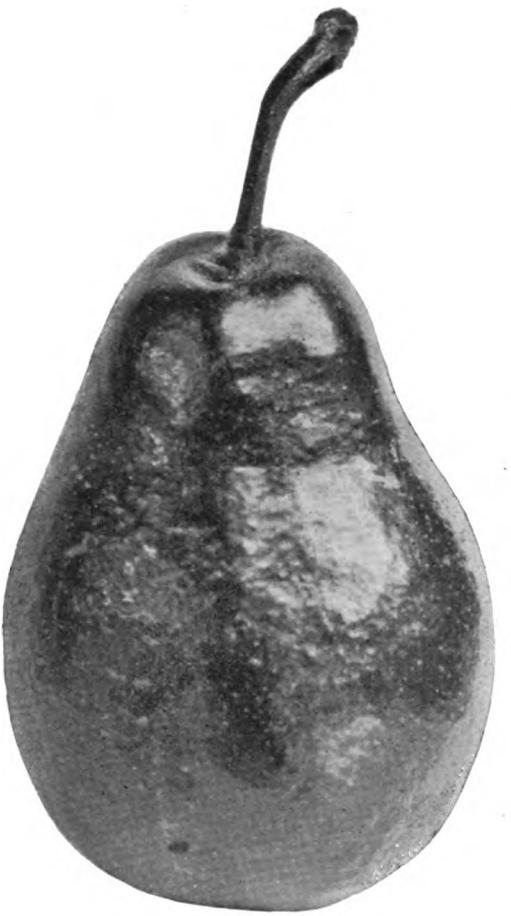
LOUISE. (*Louise Bonne de Jersey.*)



LOUISE.

An excellent export pear, if well grown. This and the Duchess have long held the first place as market varieties with growers of dwarf pears in Ontario.

ORIGIN: at Avranches, France, about 1780, by Mr. Longueval, and named after Madam Louise de Longueval. About 1827, grafts were secured by Andre LeRoy, of Angers. The original tree is said to be still standing.

TREE: hardy in southern Ontario, succeeds better on quince than on pear stock; a vigorous, upright grower; very productive, if well cultivated and set in deep, rich sandy loam.

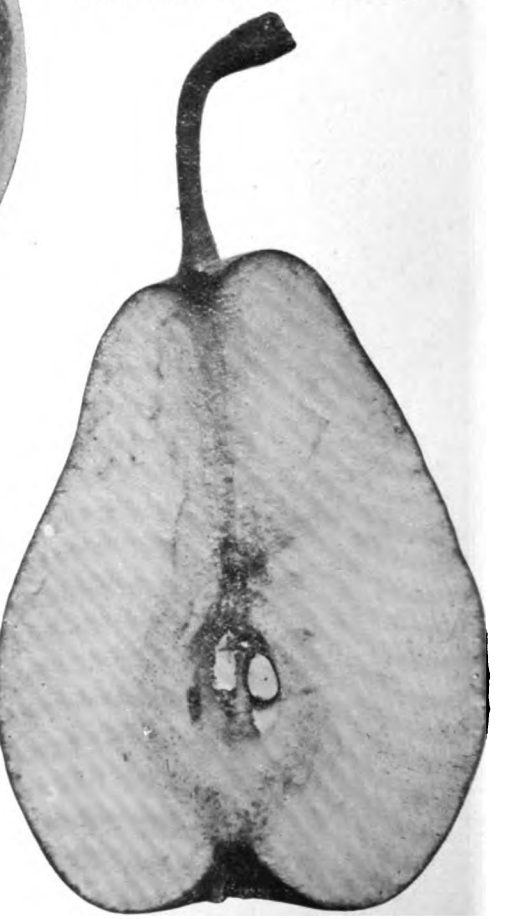
FRUIT: large; form, pyriform, sides usually unequal; skin, smooth, yellowish green, with brownish red cheek, with numerous red and brown dots; stem, 1 to 1½ inches long, usually fleshy at insertion on one side, somewhat swollen at each extremity, set in a very slight, if any, depression; calyx, half closed, set in a wide, shallow, slightly plaited basin.

FLESH: white; texture, fine grained, juicy, buttery, melting; flavor, pleasant, aromatic.

QUALITY: very good for dessert purposes.

VALUE: home market, fair; foreign market, first class.

SEASON: September to October.



SECTION OF LOUISE.

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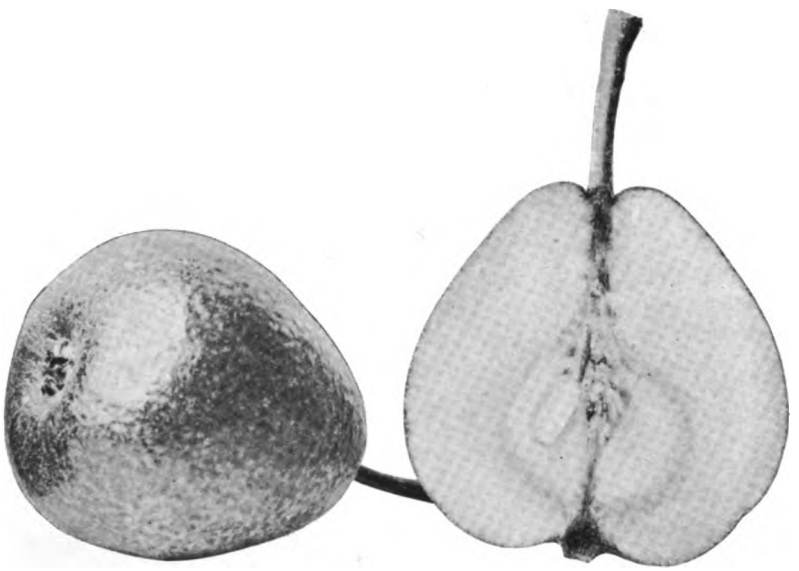
MANNING. (*Manning's Elizabeth.*)

A pretty little pear, desirable in the amateur's garden, but too small for the commercial orchard.

ORIGIN: in Louvain, in 1819, by Van Mons, who sent scions to America in 1832, to the Massachusetts Horticultural Society. Mr. Manning, having been asked by Van Mons to give it a name, called it, in 1840, Elizabeth of Van Mons, but Downing, 1842, proposed that it be called Manning's Elizabeth, to honor the zeal of this horticulturist in importing new fruit trees.

TREE: healthy, of medium vigor, shoots dull red; very productive.



MANNING.

FRUIT: size, small; form, regular, obovate, swollen towards the base; color, bright yellow, covered on the basal half with a deep brownish red, which often spreads over the sunny side; stem, one inch in length, swollen at the top, often set in an oblique depression; calyx, open, set in a shallow basin.

FLESH: color, creamy white; texture, fine, buttery, moderately juicy; flavor, sweet, rich, aromatic.

QUALITY: very good for dessert or pickling.

VALUE: second class for market purposes.

SEASON: August.

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MARGUERITE. (*Petite Marguerite.*)

Among the desirable varieties of dessert pears for the home garden, we would certainly include the Petite Marguerite, a pear of the highest quality for table use. At Maplehurst, the tree has proved itself an abundant bearer and a good grower. The fruit is not large, but, as size is not an object in a dessert pear, this is not a fault. Its season is immediately after the Giffard and just before the Clapp and the Tyson. As a market pear, it is hardly to be commended, because of its small size and color; and it will be a long time before we can convince the average dealer that size and color are not the chief considerations in a fruit.

ORIGIN: Angers, France, in nurseries of Andre LeRoy.

TREE: second rate in vigor, and first rate in productiveness; succeeds as either standard or dwarf, but more vigorous as a standard.

FRUIT: small size to medium; form, oblate, obtuse pyriform; skin, light green, often tinged and mottled with bright red on sunny side, yellowing somewhat at maturity; stalk, 1¼ inches to 1½ inches in length, set in a narrow cavity, of which one side is often much higher than the other; calyx, partly open, in a shallow corrugated basin.

FLESH: white, yellowish at core; texture, fine, melting, juicy; flavor, sweet, vinous. agreeable.

QUALITY: very good for dessert.

VALUE: second class, should only be planted for home use.

SEASON: August.

OSBAND. (*Osband's Summer.*)

Widely grown in North America. A good dessert pear for home garden, but the fruit is small and the tree is too scant a bearer to be profitable.

ORIGIN: Wayne County, New York State.

TREE: a moderately upright grower, healthy, fairly productive, an early bearer.

FRUIT: size, small; form, obovate, slightly pyriform, regular; color, yellowish green. turning quite yellow at maturity, with a brownish red cheek and numerous small green and brown dots; stem, ⅞ of an inch long, set in a small, abrupt cavity; calyx, half open, in a broad, slightly depressed basin; core, small; seeds, small.

FLESH: color, white; texture, fine grained, juicy; flavor, perfumed, sweet, rich and pleasant.

QUALITY: dessert, very good; cooking, fair.

VALUE: home market, second class; distant market, fourth class.

SEASON: August.

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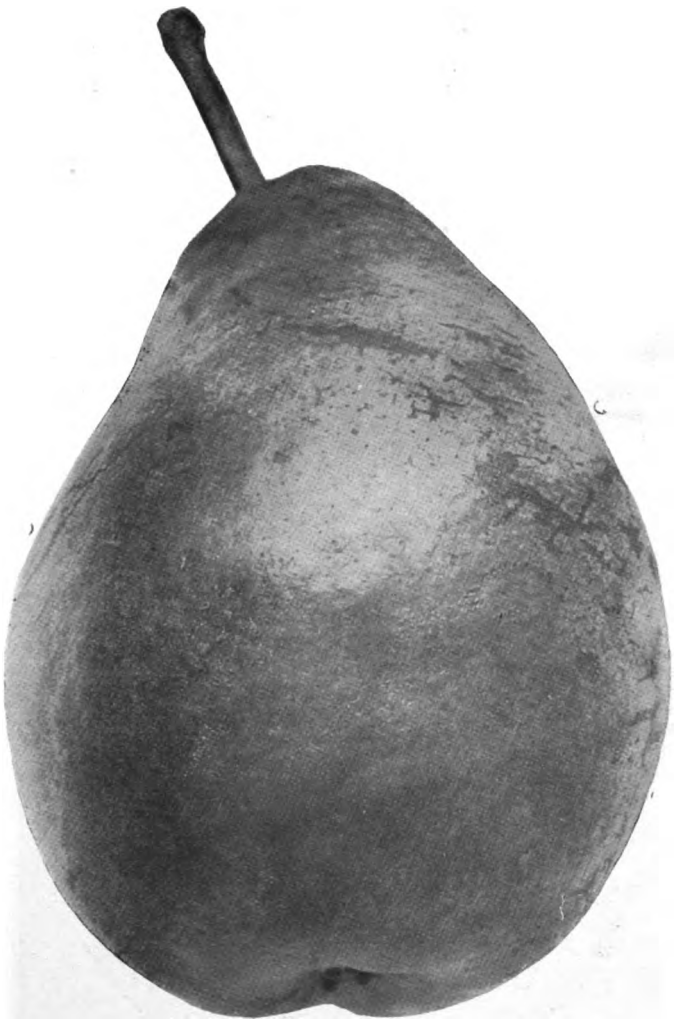
PITMASTON. (*Pitmaston Duchess d'Angouleme.*)

A very promising variety, succeeding well as a dwarf; its large size, good shipping character, fine quality, and regular form, seem to make it very valuable for export. The fruit is too large to be grown as a standard.

ORIGIN: raised by John William, of Pitmaston, England; a cross between Duchess and Glout Morceau.

TREE: a very vigorous grower, and quite productive.



PITMASTON.

FRUIT: very large, oblong, obovate, obtuse, pyriform; skin, pale yellow, with light russet in cavity; stem, stout, 1½ to 1⅝ inches long, set in a small cavity; calyx, prominent, half open, set in a very shallow, shouldered basin.

FLESH: color, creamy white; texture, very fine, melting and juicy; flavor, very pleasant, aromatic, sometimes slightly astringent.

QUALITY: good, not quite equal to that of Duchess.

VALUE: not grown in Ontario.

SEASON: September and October.

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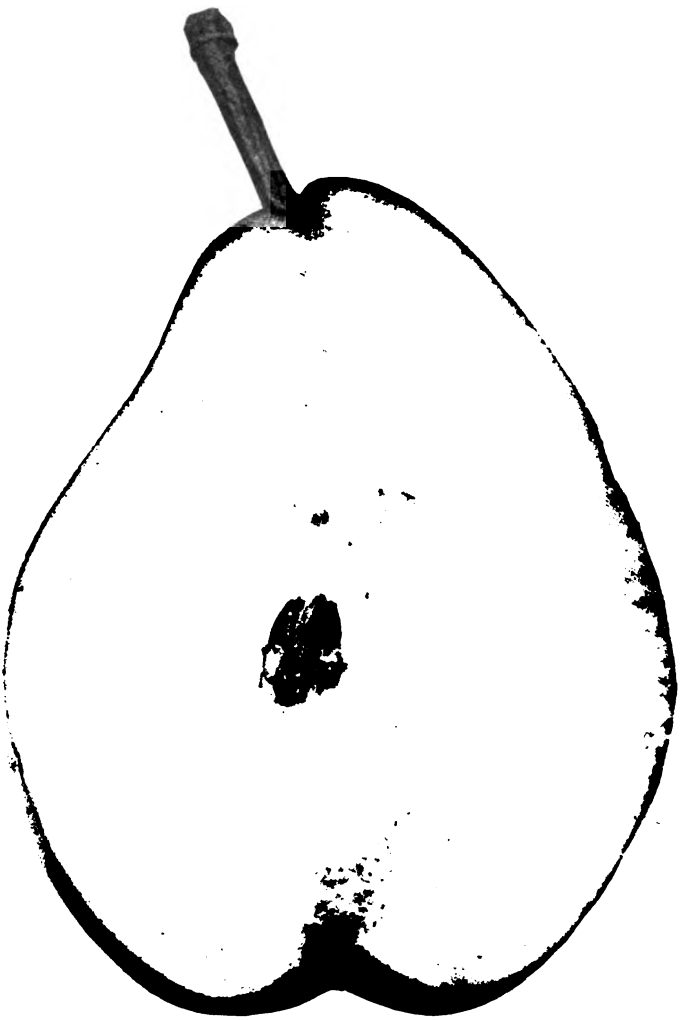
PRESIDENT MAS.

A large, handsome winter pear.

ORIGIN: France.

TREE: a moderate grower; does best on quince stock.

FRUIT: size, large; form, obovate pyriform, irregular; skin, yellow at maturity.



SECTION OF PITMASTON.

FLESH: white; texture, melting, juicy; flavor, vinous, very good.

QUALITY: dessert, first rate.

VALUE: not grown in Ontario.

SEASON: December to January.

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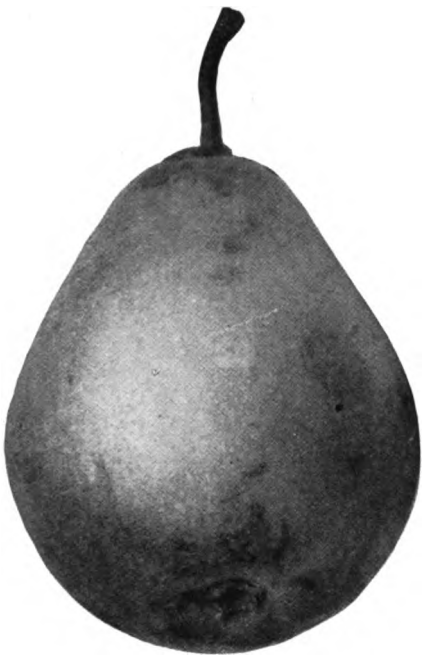
RITSON.



RITSON.

A delicious dessert pear, which is worthy of a place in every fruit garden; it is not surpassed for canning or for pickling, having an aroma and peculiarly agreeable flavor.

ORIGIN: Oshawa, Ontario, with Mr. Wellington. In response to our inquiry, Mr. W. E. Wellington writes:—"It was my grandmother, Mrs. John Ritson, who planted the seeds from a pear which had been sent her from Boston. The tree has always stood on my grandfather's homestead as long as I can remember."

TREE: strong, healthy, upright grower. The original tree is now of immense size, probably over 30 feet high, and about one hundred years old. An annual bearer of nice, evenly formed fruit.

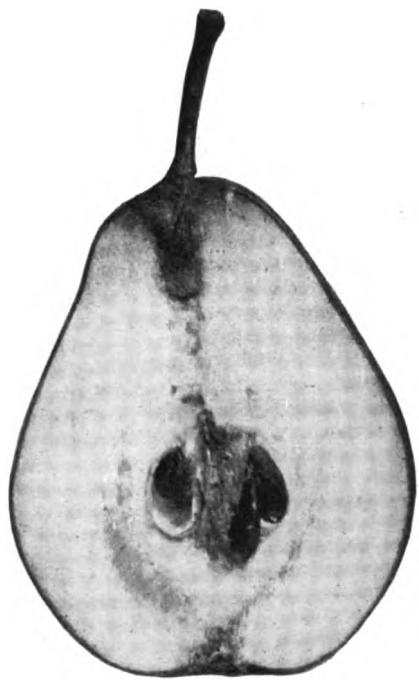
FRUIT: size medium, form obovate, pyriform, usually one-sided; color of skin yellow, heavily shaded with golden russet, and numerous minute dots of a darker russet; stem one-inch long, often inserted in a fleshy protuberance, and at a slight inclination; calyx open wide in a very shallow, regular basin.

FLESH: creamy white; texture fine, tender, buttery, juicy; flavor, sweet, delicately perfumed.

QUALITY: dessert very good to best; cooking very good.

VALUE: market promising for a special trade.

SEASON: October.



SECTION OF RITSON.

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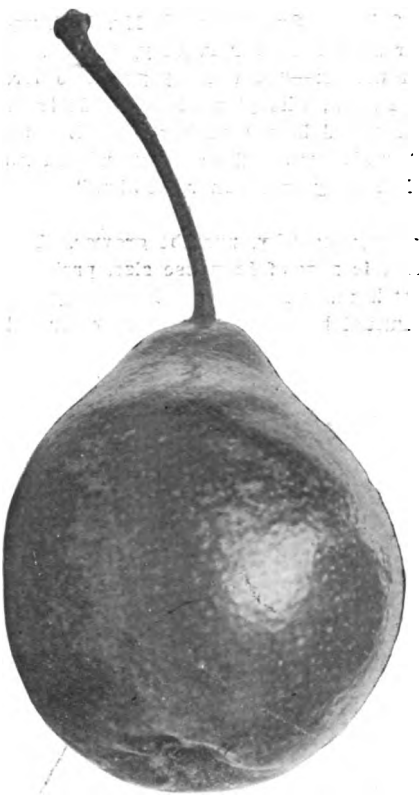
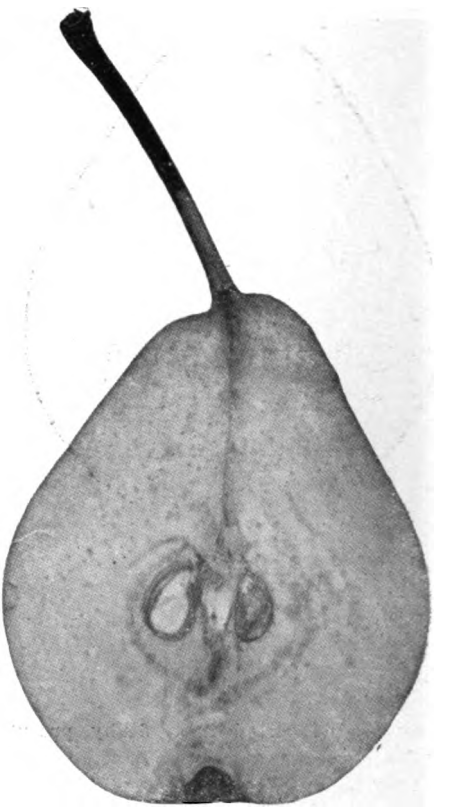
ROSTIEZER.

A small unattractive looking pear, of very high quality. It is the best of its season in quality for dessert purposes, and should have a place in the home garden. What the Seckel is in October, this pear is in August. The pear sells far below its value on account of its ordinary appearance.



ROSTIEZER.



SECTION OF ROSTIEZER.

TREE: healthy, vigorous, of sprawling habit; shoots few, and need shortening in.

FRUIT: small to medium, obovate, oblong pyriform; skin green, sometimes turning yellowish, with reddish brown cheek; stem slender and nearly two inches in length; calyx open; basin small.

FLESH: juicy, melting, sweet, very delicious, of very finest quality.

VALUE: market, third class.

SEASON: mid to late August.

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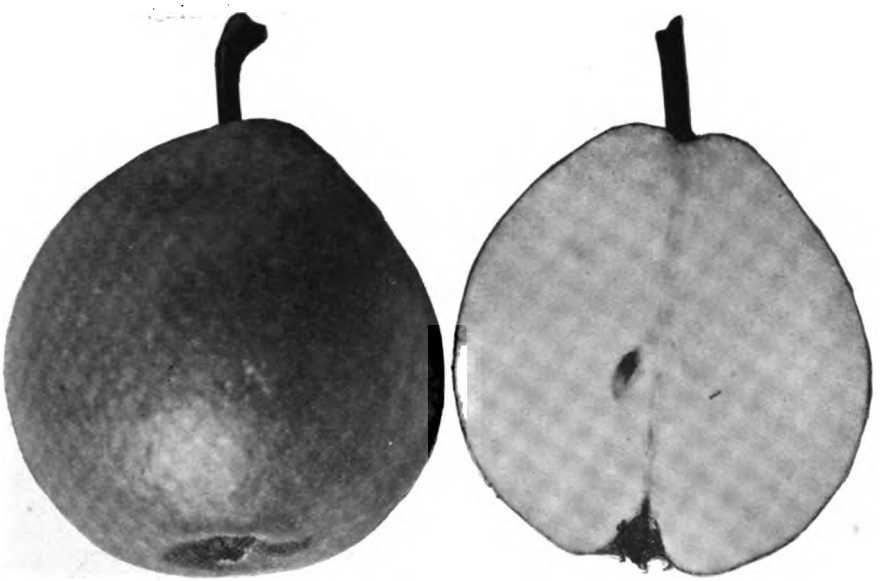
SECKEL.

The finest dessert pear in cultivation, and one that should never be omitted from the garden, when planting pears for home use. Downing calls it "The richest and most exquisitely flavored variety known." At Maplehurst it has been grown both as a dwarf and as a standard; in the former case with the most satisfactory results, but in the latter, smaller, less highly flavored and less attractive in appearance.

Its small size rules it out of the commercial orchard, unless one can cultivate a very special demand among a certain class of consumers who will appreciate its high quality.

ORIGIN: on the farm of Mr. Seckel, of Philadelphia, near the Delaware river, where, in 1884, the original tree was still standing, aged one hundred years, and having reached the height of thirty feet. The Seckel was first introduced into England, into the garden of the Royal Horticultural Society in 1819.



SECKEL.

TREE: healthy, hardy, and productive; forms a compact symmetrical head; wood olive brown in color, stout and short jointed; succeeds best as a dwarf.

FRUIT: size small, form obovate, regular and even; color dull brownish green, yellowing as it ripens with a deep brownish red cheek; stem half an inch in length, in a very small cavity; calyx small, open, in a shallow basin.

FLESH: white; texture very fine grained, melting and juicy; flavor honey-sweet; rich, spicy, with delicate aroma.

QUALITY: dessert best; cooking good.

VALUE: first class for a special market; but second class where not known, on account of its small size.

SEASON: September to October.

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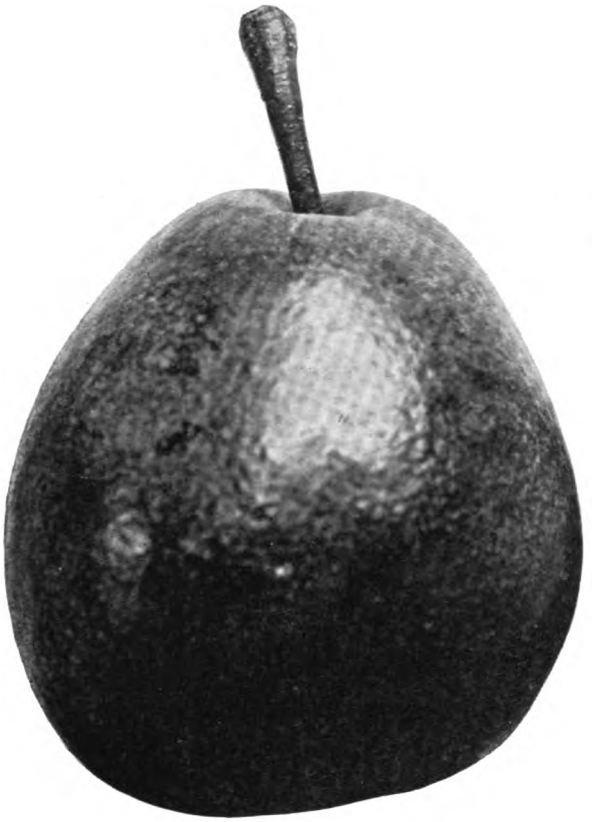
SHELDON.



SHELDON.

One of the most delicious of dessert pears, if eaten just at the proper time.

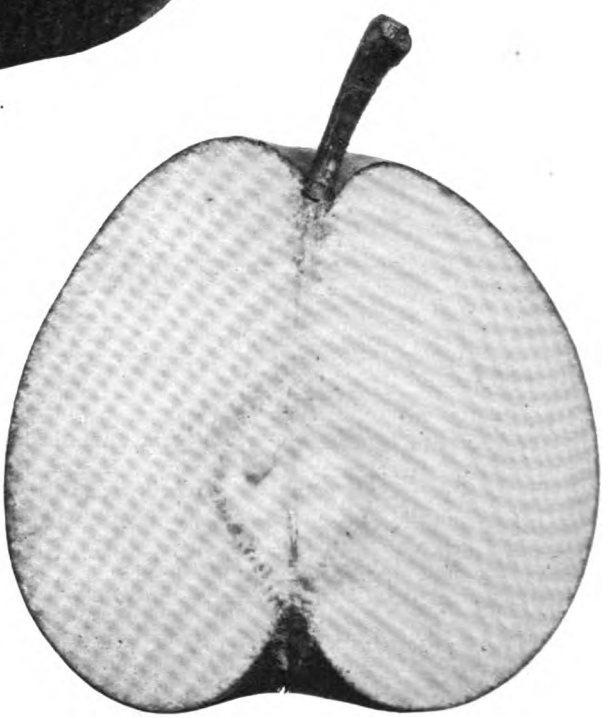
ORIGIN: accidental on farm of Norman Sheldon, of Huron, Wayne Co., N.J.

TREE: vigorous, erect, not very productive, late coming into bearing.

FRUIT: above medium in size, roundish, obtuse obovate; skin yellowish-green, covered with thin light russet, brownish crimson in sun, russet dots; stalk short, stout, in a narrow cavity; calyx nearly open, in a broad basin.

FLESH: color creamy; texture buttery, juicy; flavor sweet, aromatic.

SEASON: October.



SECTION OF SHELDON.

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SAPIEGANKA.

A Russian pear of fine appearance, scions of which were sent out to Mr. L. Woolverton in 1892, by M. Jaroslav Niemetz, of Winnitza, Podolie, Russia. Its fine appearance is in its favour, but its quality is inferior to other varieties of its season, and, unless it should prove desirable on account of its hardiness, would not be worthy of general cultivation. Mr. Niemetz says: "In its home in Lithuania, old and large trees are met with which have endured many and severe winters in the Tamboff Government. It is the most hardy of all pears there grown, and, therefore, is certainly a hardy variety. The flavor of the flesh depends upon local conditions, for, though it is tasteful enough in the warmer districts, it is sometimes harsh; when grown in the north is juicy and buttery."

TREE: hardy, productive, but subject to blight.

FRUIT: size medium, oblate, often somewhat flattened; color brownish yellow, with brownish red in sun, with numerous small dots; stem long in small cavity; calyx segments large, partly open in a broad, wrinkled basin.

FLESH: white; texture coarse, somewhat firm and juicy.

QUALITY: dessert poor; cooking poor.

VALUE: market third class.

SEASON: August.

ADAPTATION: succeeds well at Grimsby. Tested by the Dominion Experimental Farms and found tender in Manitoba and the Northwest, but perfectly hardy at Ottawa and in Muskoka.

SOUVENIR (*Souvenir du Congres*).

A very large, showy pear, but coarse in flesh and of ordinary quality. Single trees are found in many Ontario fruit gardens, but so far we know of no orchards of this variety planted for profit. Hogg, the British pomologist, however, speaks of it more highly, as follows:—"A very handsome and excellent pear; ripe in the end of August and the beginning of September. It has a great resemblance to the Bartlett, but is quite a distinct fruit."

ORIGIN: France, by M. Morel, of Lyon-Vaise, and dedicated to the Pomological Congress at France.

TREE: vigorous and productive, pyramidal.

FRUIT: very large, form oblong obovate, undulating in outline; color clear yellow when ripe, with a red cheek and many brown dots; stem ¾ of an inch long, stout, much inclined, inserted without a cavity; calyx large, open, set in a deep basin.

FLESH: color white; texture tender, but coarse, juicy, melting; flavor rich vinous, aromatic, somewhat resembling that of Bartlett.

QUALITY: dessert fair; cooking not tested.

VALUE: home market first class.

SEASON: late September and early October.

ADAPTATION: not widely tested in Ontario.

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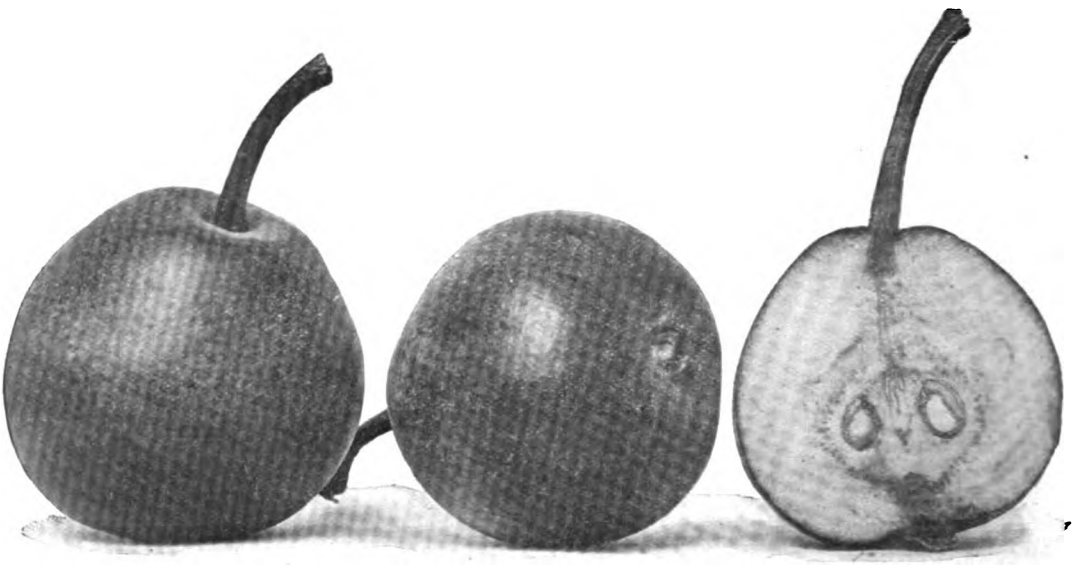
SUMMER DOYENNE (*Doyenne d'Ete of Hogg; Doyenne de Juillet of Le Roy*).

For the home garden this pear is most desirable not only for its good quality for dessert purposes, but because it has no competitor in the last half of July. It should be gathered before it is mellow to preserve its juciness, for, if ripened on the tree, it becomes mealy and insipid. Its very small size makes it undesirable in the commercial orchard, especially now that we must compete with larger varieties from California, which ripen earlier in that climate than they do with us.

ORIGIN: Dr. Van Mons, Professor at Louvain, Belgium, about 1823, at which time he had on his grounds about 2,000 seedlings of merit.

TREE: vigorous young shoots, light yellowish brown, of upright slender habit; an early and abundant bearer; succeeds as dwarf or standard.



SUMMER DOYENNE.

FRUIT: small; form roundish, obovate; color green to lemon yellow with brownish red cheek on the sunny side, and numerous grey dots; stalk about an inch long, sometimes longer, stout, attached in a very slight depression; calyx small, half open, in a shallow plaited basin.

FLESH: white; texture fine, tender, juicy; flavor sweet and pleasant with slight aroma.

QUALITY: dessert very good; too small for cooking.

VALUE: too small for a market pear, except in limited quantities.

SEASON: July.

ADAPTATION: hardy in Southern Ontario; fairly hardy in Bruce and Huron.

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TRIUMPH.

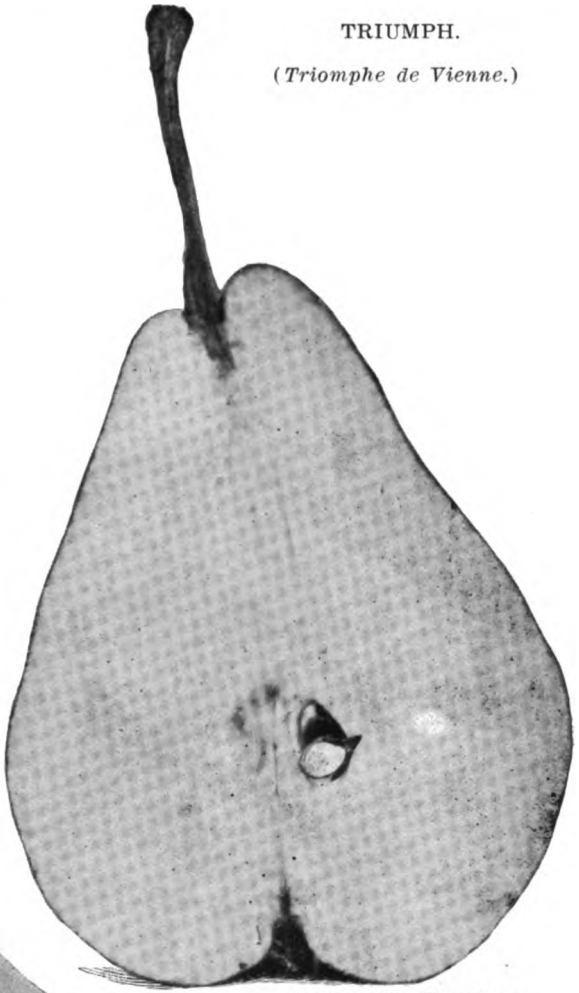
(Triomphe de Vienne.)

A very fine, large, showy pear, a trifle later than Bartlett, larger in size, but not equal to it in quality; promising as a commercial variety.

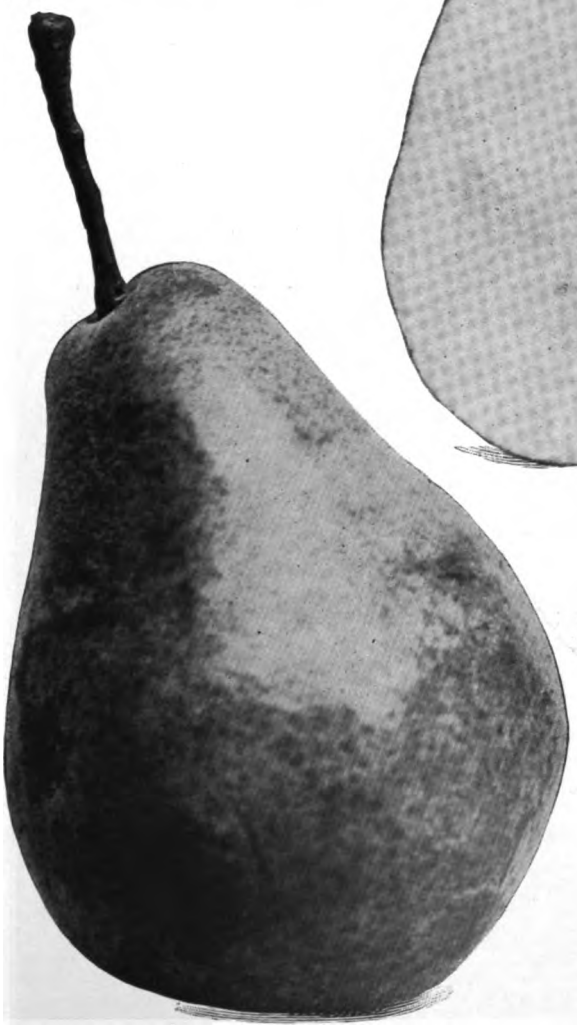
ORIGIN: France.

TREE: a thrifty, upright grower; productive.

FRUIT: large; form obovate, pyriform, somewhat uneven and irregular; skin greenish yellow, with patches of russet; stem one and a quarter inches long, set in a shallow, uneven, often one-sided cavity; calyx open, in a broad, irregular, russeted basin.



SECTION OF TRIUMPH.



TRIUMPH.

FLESH: creamy white, very juicy; flavor rich, sweet and excellent.

QUALITY: dessert very good; cooking very good.

VALUE: market, home or foreign, second class.

SEASON: September.

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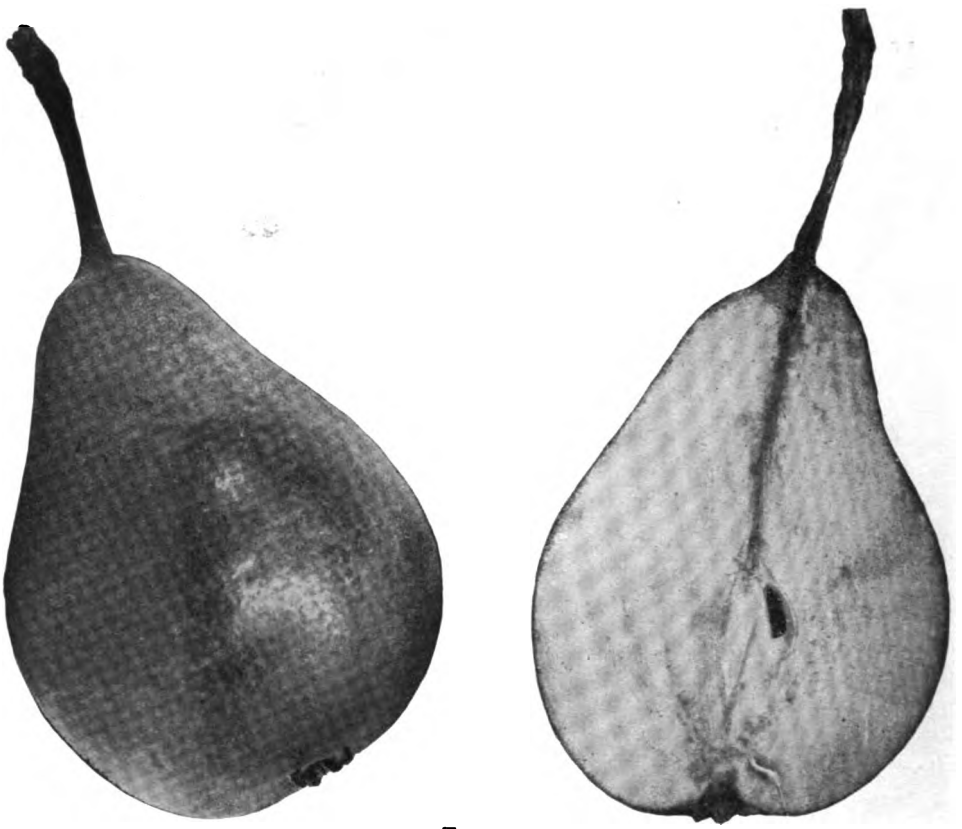
TYSON.

A fine pear yielding enormous crops of medium sized fruit, very good for dessert or cooking; but too near the season of the Bartlett to be profitable for market.

ORIGIN: a seedling found in a hedge on the farm of Jonathan Tyson, near Philadephia.

TREE: vigorous; upright; very productive.

FRUIT: size medium; form acute pyriform; color green, turning yellow when fully ripe, russet about basin, cheek crimson, dots brown, numerous; stem 1¼ inches long more or less fleshy at base; calyx open.



TYSON.

FLESH: color white; texture tender, buttery, fine grained, juicy; flavor sweet, aromatic, excellent.

QUALITY: dessert very good; cooking very good.

VALUE: home market second class.

SEASON: August.

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VICAR (*Vicar of Winkfield of Hogg; Cure of Leroy*).

A French pear considerably grown in Ontario as a winter pear, but it does not reach its best perfection in our climate and does not deserve a place in our orchards.

ORIGIN: found wild near Clion, France, by M. Leroy, curate of Villiers-en-Brenne, in the year 1760; distributed in France under sixteen different names; introduced into England by the Rev. W. L. Rham, vicar of Winkfield, in Berkshire, hence its English name.

TREE: vigorous, but somewhat susceptible to blight; very productive.

FRUIT: large; form long pyriform, one-sided; skin green, seldom tinged with brown on the sunny side, and marked with small brown dots; stem usually one and a half inches long, fleshy at base, and inserted obliquely without a cavity; calyx open, with large segments, set in a shallow basin.

FLESH: greenish white; texture firm, not very juicy as grown in Ontario; flavor fair, if well ripened.

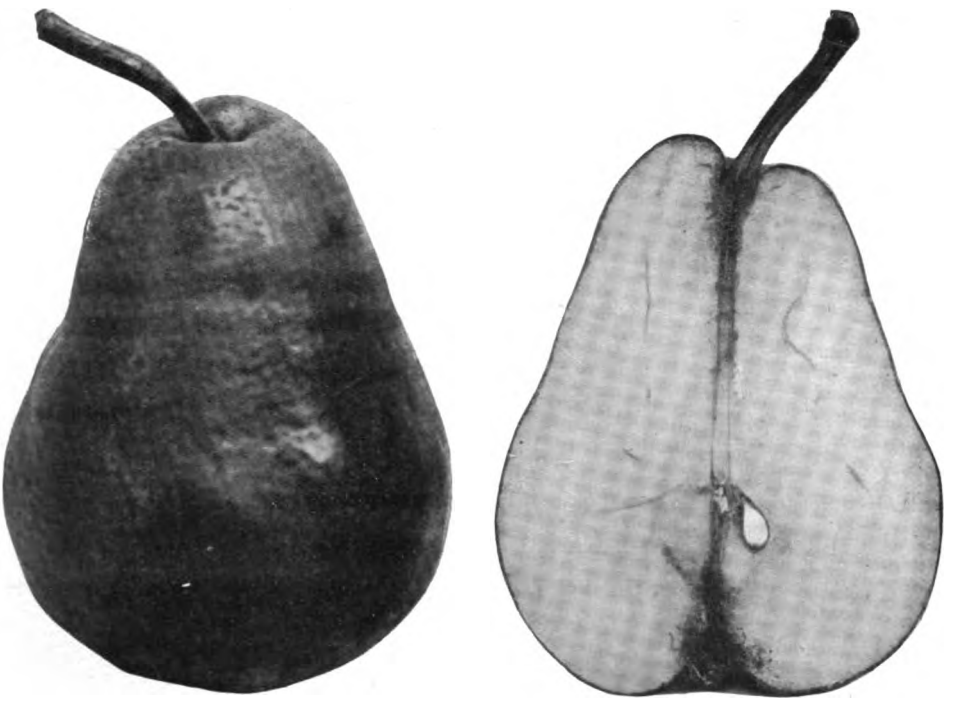
QUALITY: dessert very poor; cooking fair.

VALUE: home and foreign market second class.

SEASON: early winter.

WILDER.

A valuable early market pear, being beautiful in appearance, of fair size and very good flavor; probably the best of its season, but inclined to rot at the core if left hanging on the tree.



WILDER.

ORIGIN: chance seedling on south shore of Lake Erie.

TREE: vigorous, very productive, and an early bearer when grafted on the quince.

FRUIT: fair to large in size; form ovate, obtuse pyriform, sometimes shouldered at stem; color greenish-yellow, with deep red cheek and numerous gray dots; stem stout, three-quarters to one inch in length; calyx open.

FLESH: white; texture tender, fine grained; flavor sweet, aromatic and very pleasant.

QUALITY: dessert very good.

VALUE: home market first class.

SEASON: August.

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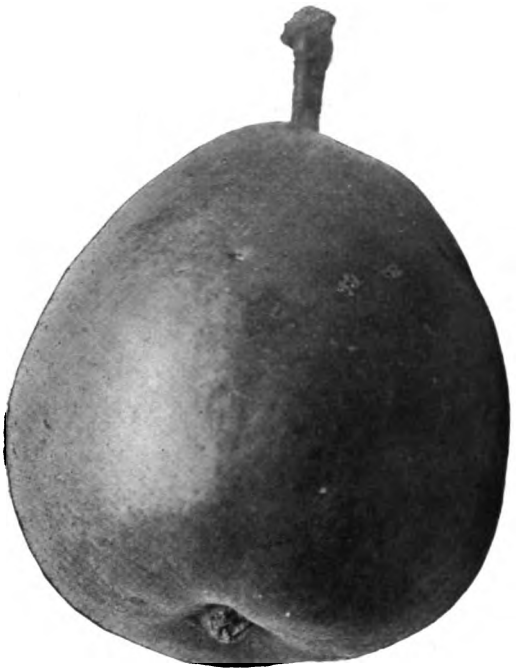
WHITE DOYENNE (*Virgalieu of New York State*).



An old variety with many French synonyms, of which the proper one according to LeRoy is La Doyenne. Downing speaks of it as "unquestionably one of the most perfect of autumn pears," and on account of its excellent quality and the productiveness of the tree, it was at one time widely planted in the commercial orchards of Ontario and the United States. Latterly, however, like the Flemish Beauty, it has become subject to black spot, for which reason it is losing favor.

ORIGIN: France.

TREE: healthy, not subject to blight; a fairly vigorous grower, and an abundant bearer; usually grown as a standard.

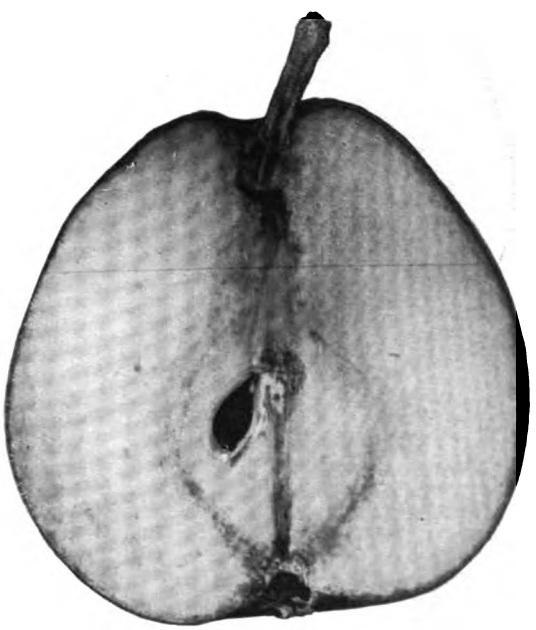
FRUIT: size medium to large, form obovate, variable in length; skin green at first, changing to yellow as it ripens, sometimes red in the sun, sprinkled with numerous russet dots; stem ¾ of an inch long, set in a shallow cavity; calyx half closed in a shallow slightly plaited basin.

FLESH: white, texture fine grained, buttery, fairly juicy; flavor sugary, aromatic, perfumed.

QUALITY: dessert very good; cooking very good.

VALUE: market second class.

SEASON: September and October.



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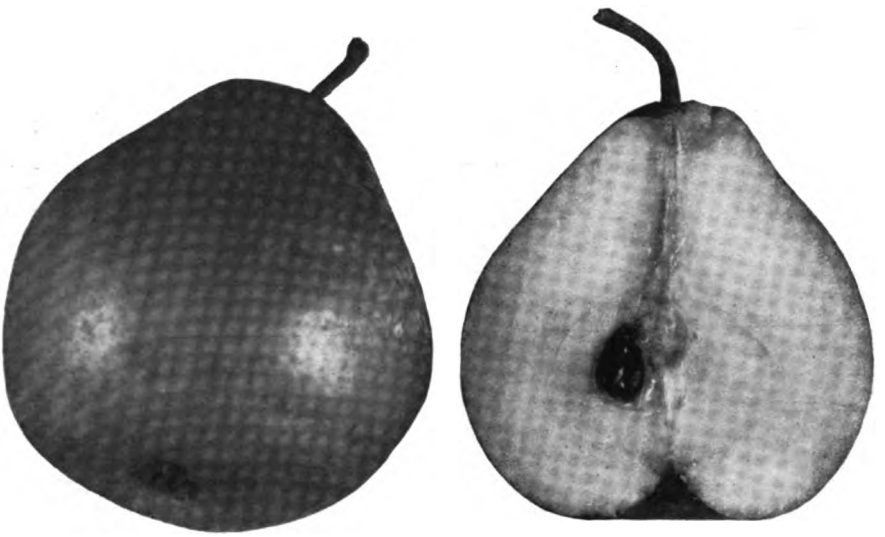
WINTER NELIS

An old variety of excellent quality, which has long occupied a high place as a winter dessert pear to succeed the Lawrence; scarcely large enough nor attractive enough to be highly recommended for the commercial orchard.

ORIGIN: raised by Jean Charles Nelis, of Malines, in Belgium; introduced into England in 1818.

TREE: a spreading, straggling, stocky grower; should be topworked; hardy; an early bearer; very productive.



WINTER NELIS.

FRUIT: size small to medium; form roundish obovate, short pyriform; color of skin dull green, becoming yellowish green with dots and patches of brown russet; stalk about one and a quarter inches long, curved, set in a narrow cavity; calyx open, with erect segments, in a shallow, somewhat plaited basin.

FLESH: color yellowish white; texture fine grained, buttery, juicy; flavor rich, sugary, vinous, aromatic.

QUALITY: dessert very good to best; cooking good.

VALUE: market second class.

SEASON: early to mid-winter.

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THE PLUM

The plum has a wider range over the Province of Ontario than the pear or peach, this fruit being a native of the Province and found as far north as Manitoba.

There are three large groups into which the plums may be divided here, namely, the European, Japanese, and American. In the European or domestic group are included most of the varieties which are grown in Ontario commercially. These plums are not as hardy as the natives, hence their profitable culture is limited to almost exactly the same districts as the pear, the commercial orchards being mostly found in southern Ontario, the Georgian Bay District, and along Lake Ontario west of the Bay of Quinte. A few of the hardiest produce crops occasionally in eastern Ontaria and up to about latitude 45 degrees in central Ontario, but they are too uncertain to be grown for profit.

The Japanese plums are grown over practically the same area as the European, but the fruit buds average a little more tender.

In the American group are included the Americana and Nigra plums, the former being derived from a hardy United States species and the latter from the native Canadian plum. The varieties of this group are quite hardy and can be grown commercially where the European and Japanese plums will not succeed, and while not so good in quality as the others good prices are at present obtained for what are produced.

Plums are not being so extensively planted at present as other large fruits, since during recent years the markets have several times been glutted, resulting in low prices. The demand for plums is, however, always large, and the excellent market which is opening up in the Northwest will probably in the future prevent, in a great measure, this over supply.

The cultural directions for the apple will apply in most particulars to the plum, which will succeed on almost all kinds of well-drained soils, although it does best on the heavier clay loams. Trees one or two years of age should be planted about eighteen feet apart each way, the soil having been thoroughly prepared beforehand. The trees should be severely headed back when planted, and future pruning will consist in forming a well-shaped open head. As some varieties make exceptionally strong growth it is a good practice when the trees are young to prune the young growth back about one-half each spring to avoid splitting. When the trees begin to bear little pruning is necessary, as they usually bear so heavily that the trees do not make much growth annually.

Orchards should be kept thoroughly cultivated, and cover crops are recommended as for the apple, cherry, peach and pear. The fruit should be picked when it is well colored but still firm.

Varieties Recommended.

General Lists, approved by the Board of Control.

Americana: These are extremely hardy and desirable where the European and Japanese varieties cannot be grown. Aitken, Cheney, Bixby, Mankato, Wolf, Hawkeye, Stoddard.

European: Bradshaw, Imperial Gage, Gueii, Shippers' Pride, Lombard (liable to overbear, requires thinning), Quackenboss, Yellow Egg, Grand Duke, Golden Drop (Coe), Reine Claude (one of the best for canning).

Japanese: These are apparently quite as hardy as the European varieties: Red June, Abundance, Burbank, Climax.

DISTRICT LISTS.

Niagara District

(Including Niagara Peninsula from the Niagara River to Hamilton and north to the escarpment.)

Robt. Thompson St. Catharines.

Red June, Climax, Shiro, Burbank, Arctic, German Prune, Shropshire Damson, Grand Duke, Monarch, Reine Claude.

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E. M. Smith, Winona.

Burbank, Bradshaw, Lombard, Grand Duke, Monarch, Reine Claude, Shropshire Damson, German Prune, Fallenburg, Washington for deep, dry soil.

OAKVILLE DISTRICT

(Including the southern part of the counties on Lake Ontario between Hamilton and Toronto).

A. W. Peart, Burlington.

European: Bradshaw, Niagara, Imperial Gage, Lombard, Prince of Wales, Yellow Egg, Reine Claude, Staunton.
Japanese: Red June, Abundance, Burbank.

W. F. W. Fisher, Burlington.

European: Bradshaw, Imperial Gage, Lombard, Reine Claude, Grand Duke.
Japanese: Red June, Abundance, Burbank.

ESSEX PENINSULA

(Including Essex, Kent and Pelee Island).

J. L. Hilborn, Leamington.

Burbank, Lombard, Imperial Gage, Yellow Egg, Reine Claude.

J. Aitkin & Son, Leamington.

Burbank, Grand Duke, Lombard, Reine Claude.

FOREST DISTRICT

(Including County of Lambton).

D. Johnson, Forest.

Bradshaw, Imperial Gage, Reine Claude.

LAKE HURON DISTRICT

(Including Counties of Huron and Bruce).

D. F. Hamlink, Goderich.

Japanese: Burbank.
European: Bradshaw, Imperial Gage, Shippers' Pride, Lombard, Monarch, Grand Duke.

GEORGIAN BAY DISTRICT

(Including northern portions of the Counties of Grey and Simcoe, bordering on the Georgian Bay).

J. G. Mitchell, Clarksburg.

Red June, Lombard, Archduke, Yellow Egg, Golden Drop, Reine Claude.

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Lake Simcoe District

(Including the northern and eastern section of Simcoe and northern sections of York and Ontario bordering on Lake Simcoe).

G. C. Caston, Craighurst.

Burbank, Staunton.

Guelph District

(Including the high inland Counties of south-western Ontario, *i.e.*, Wellington, Waterloo, northwestern section of Perth, south part of Grey-Dufferin, and northwest section of Peel and Halton).

Prof. J. W. Crow, O.A.C., Guelph.

Bradshaw, Imperial Gage, Shippers' Pride, Lombard, Reine Claude, Glass.

St. Lawrence Valley District

(Including the valley of the St. Lawrence River from Kingston to the eastern boundary of the Province).

Harold Jones, Maitland.

American: Aitken, Bixby, Mankato, Cheney, Wolf, Schley, Brackett, Hawkeye. Stoddard.
European: Glass, Raynes, Mount Royal, Lunn.

Ottawa District

(Including the Ottawa Valley and the eastern portion of the Province not elsewhere enumerated south of latitude 46 deg.).

W. T. Macoun, Horticulturist, Central Experimental Farm, Ottawa.

American and Nigra: Aikin, Bixby, Mankato, Cheney, Wolf, Schley, Brackett, Hawkeye, Stoddard.
European: Early Red (Russian), Mount Royal, Glass, Montmorency, Raynes, Perdrigon.

Algoma District

(Including the islands of Manitoulin and St. Joseph and a limited portion of the northern and eastern shore of the Georgian Bay).

Chas. Young, Richard's Landing.

European: Glass, Lombard, Pond, Trabesh (Russian), Goliath (Russian).
Americana: Cheney, Wolf, Hawkeye, Stoddard, City.

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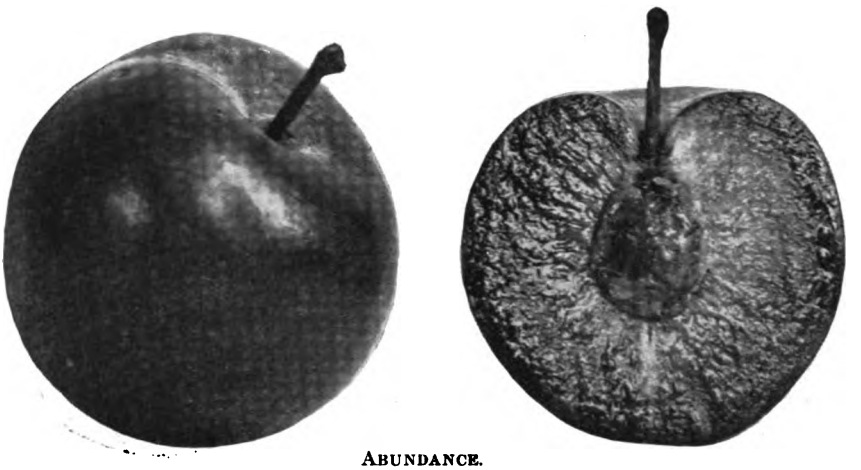
DESCRIPTION OF VARIETIES.

ABUNDANCE.

One of the best of the Japan plums for the home garden. It is early in season, being ripe about the middle of August, but matures unevenly. To get its best flavor it should be picked while still firm, and ripened indoors like a Bartlett pear; it will color beautifully, become very juicy, and the flavor will be sweet and rich.

ORIGIN: one of Luther Burbank's importations from Japan in 1884.

TREE: vigorous; productive, a six-year-old tree, at the Lake Huron fruit station, bearing six 12-quart baskets of fruit in 1901; habit upright.



ABUNDANCE.

FRUIT: size medium to large; form roundish, narrowing toward the apex; color bright red on a yellowish ground with numerous red dots; stalk strong three-quarters of an inch long, inserted in a narrow, deep cavity; suture shallow, distinct; apex pointed; pit oval; a partial cling.

FLESH: color yellow; texture tender, very juicy; flavor sweet and delicious.

VALUE: one of the best of the early plums.

SEASON: mid-August.

AITKEN.

"Fruit large, oval; cavity narrow, medium depth; suture obscure; apex pointed; color uniformly deep red all over; dots none; bloom none; skin thin; flesh deep yellow, juicy, moderately sweet, not rich or high flavored; stone large, flat, oval, semi-cling,

AITKIN.

no astringency; quality medium to above; season last week of August. Tree only fairly productive. Nigra group. The earliness of this plum is the principal point for recommendation." (*Macoun.*)

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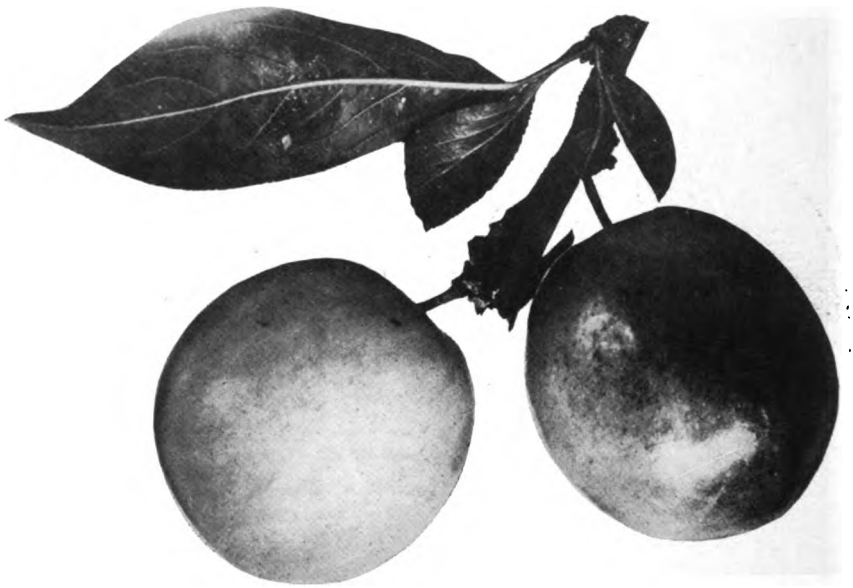
AMERICA.

TREE: large, vigorous, spreading, hardy, very productive; fruit early; one and three-quarters in diameter, roundish-oval, halves equal; cavity, shallow, flaring; suture shallow, a distinct line; apex roundish; color, clear, dark, currant-red over golden-yellow, mottled, with thin bloom; dots numerous, small, whitish, inconspicuous; stem slender, one-half inch long, adhering to the fruit; skin thin, bitterish, separating readily from the pulp; flesh yellow, juicy, fibrous, somewhat tender, sweet, not high in flavor; fair in quality; stone clinging, seven-eighths inch by one-half inch in size.



AMERICA.

ARCH DUKE.

A good market variety.

ORIGIN: imported from England, by S. D. Willard, Seneca, N.Y.

TREE: Domestica.

FRUIT: size large; form oval, necked; stem medium, stout; cavity deep, medium; color dark blue with many russet dots; bloom bluish, heavy; suture more than half round.

FLESH: yellowish; cling; texture meaty, juicy; flavor subacid, pleasant.

QUALITY: cooking, very good.

VALUE: first class in some localities.

SEASON: late.

ARCTIC.

The tree is hardy and the fruit is of some value where the better varieties do not succeed. It is very productive, but too small to bring the best prices in the market, especially in view of its ordinary quality.

ORIGIN: Maine.

TREE: hardy; fairly vigorous; productive; trees at the Lake Huron station, eight years planted, yielded from six to eight baskets each.

FRUIT: size small, form oval; color very dark purple, with thin blue bloom; suture traceable; stem slender, three-quarters of an inch long, set in a small cavity.

FLESH: color yellowish green; texture firm, moderately juicy; flavor moderately sweet; free stone.

QUALITY: dessert, useless; cooking, good.

VALUE: market, second to third class.

SEASON: mid-August to early September in southern parts of the Province, and early September in more northerly plum districts.

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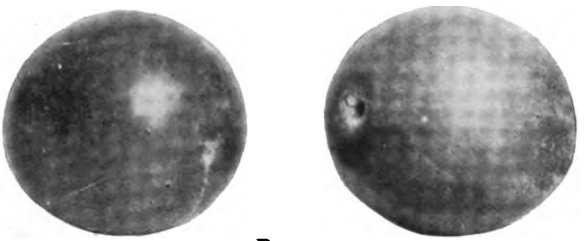
BIXBY.

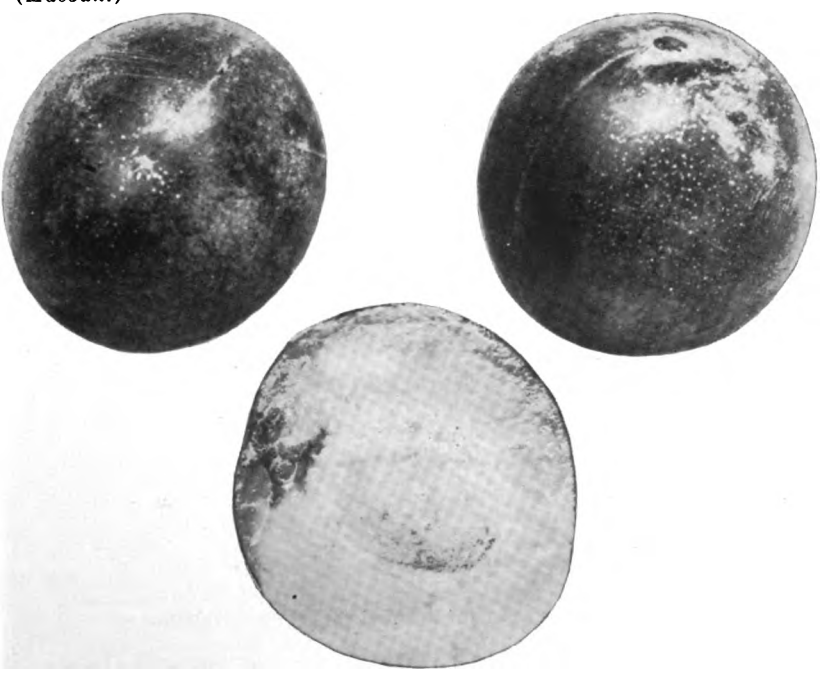
"Fruit above medium to large, roundish; cavity narrow, medium depth; suture rather indistinct, slightly depressed; apex rounded; color yellow, more or less covered with bright red; dots numerous, small, yellow; bloom fairly heavy; skin moderately thick, rather tender; flesh deep yellow, juicy; stone medium size, oval in outline, considerably flattened, cling; sweet but not rich in flavor, no astringency; quality good; season late, August to early September. A very handsome early plum. Chief fault is unevenness of ripening. Makes good preserves." (*Macoun.*)



BIXBY.

BRACKETT.

"Form roundish, flattened at ends; large to very large; cavity medium width, shallow, stem half inch, slender; suture a distinct line, no depression; apex flattened, indented; color yellow, almost entirely overspread with deep purplish red; dots numerous, yellow, distinct; bloom moderate, bluish; skin thick, tough; flesh deep yellow, meaty, juicy; stone above medium, roundish, flattened, cling; sweet, rich, good flavor; quality good." (*Macoun.*)



BRACKETT.

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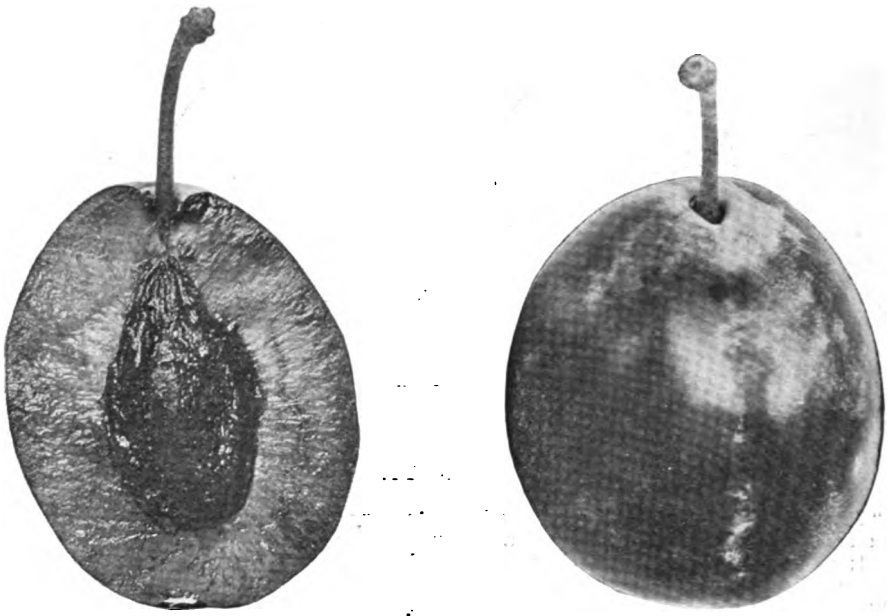
BRADSHAW (*Niagara, Blue Imperial*).

Considered by many one of our most valuable European varieties, whether for home use or market, because of its fine quality, its large size and beautiful appearance.

TREE: erect, vigorous, moderately productive with occasional heavy crops; late coming into bearing; class, Domestica.



BRADSHAW.

FRUIT: size large; stalk one inch long, slightly curved; color reddish-purple, with blue bloom; apex round, slightly depressed; suture on one side, broad and shallow.

FLESH: color yellowish; texture juicy, tender; flavor rich and sweet; pit long, thin oval, partial cling.

QUALITY: dessert, very good; cooking, very good.

VALUE: home market, first class.

SEASON: mid to late August.

BURBANK.

The Burbank is one of the best of the Japanese plums for the commercial orchard, on account of its beauty, its great productiveness, and its excellent shipping quality.

ORIGIN: It was in 1885 that Mr. Luther Burbank, of Santa Rosa, California, imported some plum trees from Japan and, when they fruited, he selected this as one of the best and most worthy of propagation. In 1891 he sent samples to the Department of Agriculture at Washington and the Pomologist of the Department named it Burbank, after the introducer.

This plum has been before us for over fifteen years, and notwithstanding the great number of Japanese varieties now sold by nurserymen, still holds the highest place.

Compared with the Domestica class, the Japanese are inferior in quality, but when fully ripened, are fairly good eating. Like the Kieffer pear, the Burbank plum is making its reputation rather on quantity than on quality.

TREE: hardy; a very vigorous, wayward grower; an early and most abundant bearer; the fruit needs thinning to secure good size.

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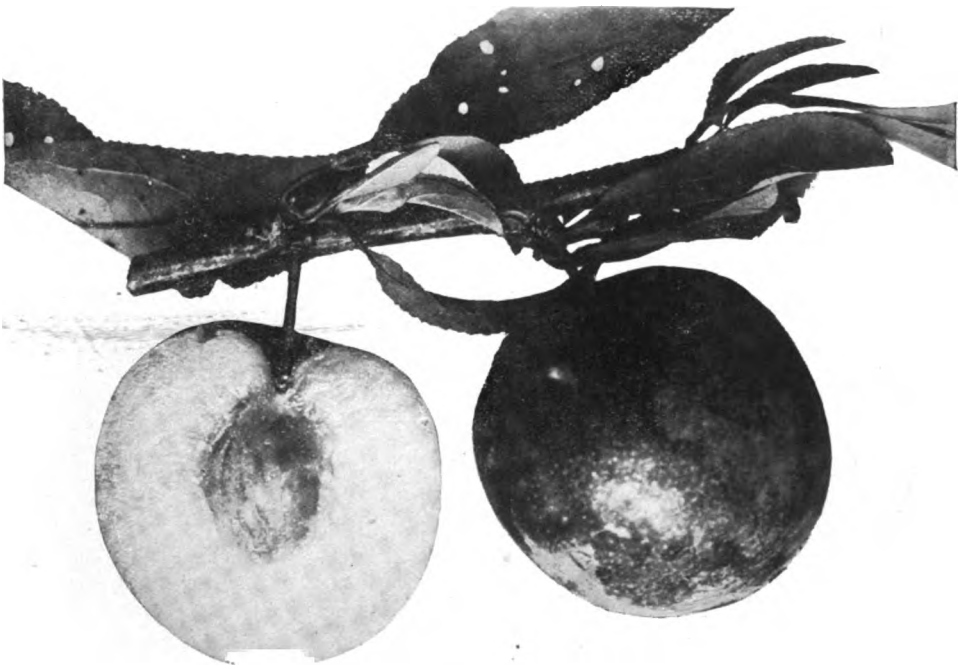
FRUIT: medium to large; form, when properly thinned, nearly round, but slightly conical; color orange yellow ground, shaded with red, and almost purple on the side exposed to the sun; skin very smooth, with a slight bloom, peels easily when ripe; suture traceable; apex a small point; stem half to five-eighths of an inch long, stout; cavity deep, abrupt, with leather-crack marks.



BURBANK.

FLESH: color amber; texture juicy and tender when fully ripe; flavor sweet, fairly agreeable; stone medium, pointed, cling.

QUALITY: good for cooking; fair for dessert.

VALUE: first class for market.

SEASON: late August.

ADAPTATION: general; succeeds fairly well on St. Joseph Island.

CLIMAX.

A very large, fine looking Japan plum; a fine market variety.

ORIGIN: Hybrid of P. Simoni and Botan, raised by Luther Burbank, of Santa Rosa, California.

TREE: vigorous; productive.

FRUIT: size very large; form heart shaped, one sided; color vermilion, with numerous white specks.

FLESH: cling; color yellow; texture firm, juicy; flavor rich, aromatic.

QUALITY: dessert, good.

VALUE: market, first class.

SEASON: mid-August.

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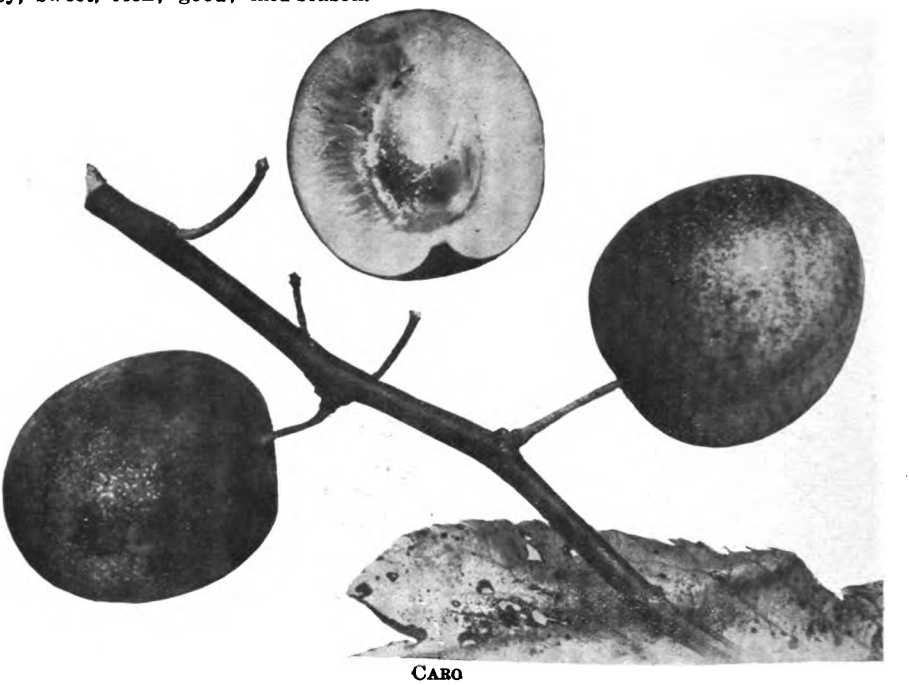
CARO.

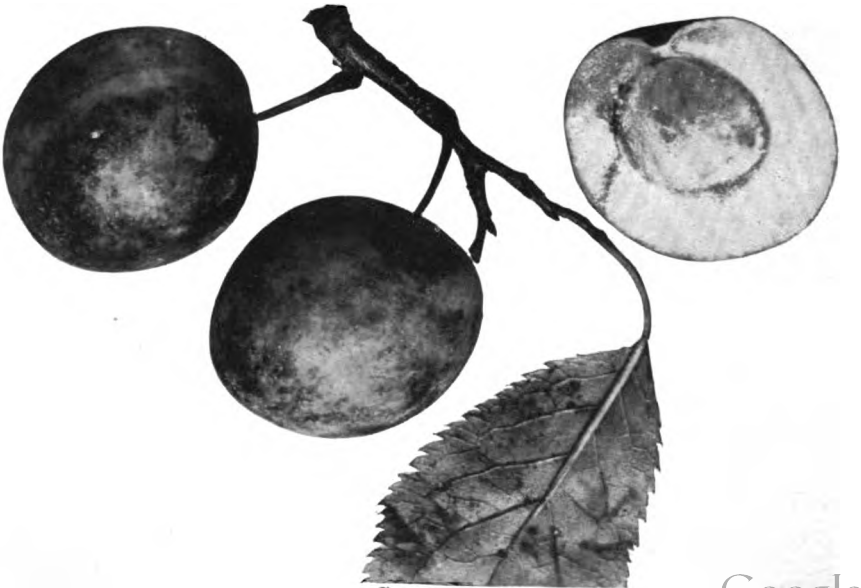
A seedling of Wolf, which originated at the Central Experimental Farm, Ottawa, Canada, in 1895. Fruit, large, roundish; suture distinct; bright red, showing yellow in patches; dots numerous, yellow, distinct; bloom light; skin thick; flesh deep yellow, juicy, sweet, rich; good; mid-season.



CARO

CHENEY.

"Fruit large, round to somewhat oval, uneven; cavity narrow, medium depth; suture merely an indistinct line; apex rounded; color uniformly deep red all over, sometimes paler on one side; dots none; bloom none; skin moderately thick, tough, not astringent; flesh deep yellow, juicy; stone medium size, flat, oval, cling; sweet, moderately rich flavor; quality good. Season late August to early September. One of the best. It soon gets soft, however, after ripening. Tree a strong grower, moderately productive. Nigra group." (*Macoun.*)



CHENEY.

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CHABOT (*Yellow Japan, Bailey*).

This is the best Japan plum of its season, which is about two weeks later than Burbank.

ORIGIN: imported from Japan by Mr. Chabot, of Berkeley, Cal., and introduced to the trade by Mr. Luther Burbank in the year 1896.

TREE: very vigorous, head fine, large, symmetrical; productive; an early bearer.

FRUIT: medium to large for a Japan plum; form oblong conical, almost heart shaped; color red, with pinkish bloom and numerous minute yellowish specks; stem three-quarters of an inch long, stout; apex a point in a narrow, deep depression; suture traceable.

CHABOT.

FLESH: color yellowish; texture moderately firm and juicy; flavor sweet, perfumed, very pleasant; clings to stone.

QUALITY: dessert, good; cooking and drying, very good.

SEASON: early to mid September.

COE (*Coe's Golden Drop*).

A popular canning plum for the home garden; scarcely productive enough to be recommended for the commercial orchard.

ORIGIN: England.

TREE: vigorous; fairly productive; class Domestica.

FRUIT: large; form oval; suture distinct; neck short; sides unequal; color golden yellow with dots of red next the sun; bloom yellow; stalk three-quarters of an inch long stout, in a shallow cavity.

FLESH: cling; color yellowish; texture firm, not fine grained; flavor sweet and pleasant.

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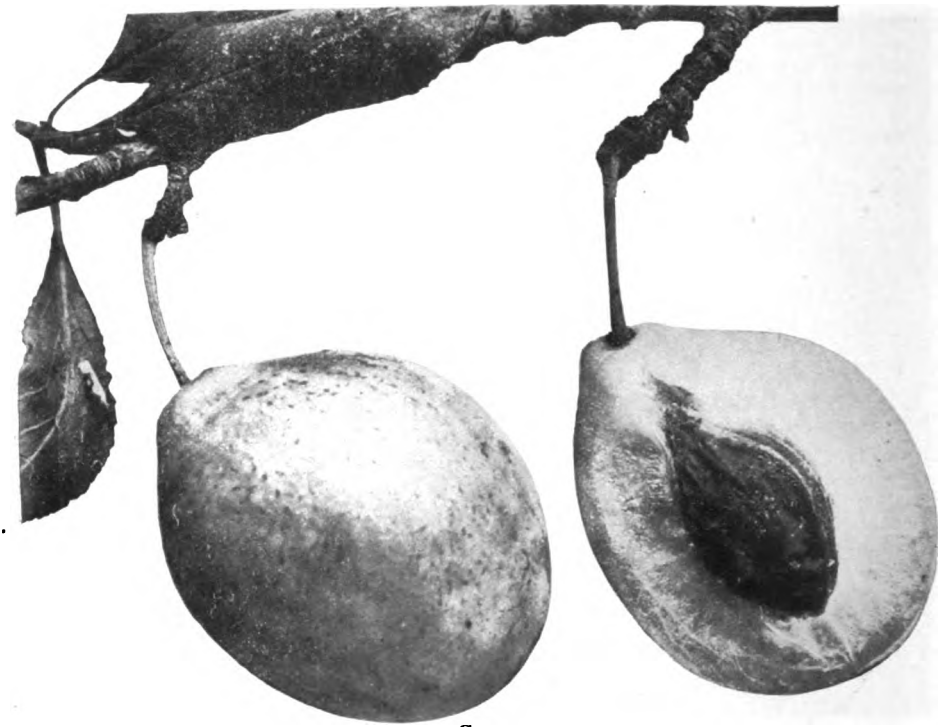
QUALITY: cooking, very good; dessert, fair.
VALUE: market, first class.
SEASON: mid-September.



COE.

COLUMBIA.

Variety somewhat like Reine Claude but not as good.
ORIGIN: New York.
TREE: large, slightly spreading, productive.
FRUIT: medium, roundish oval, dark, purplish red.
FLESH: yellow, firm and sweet.
SEASON: mid-season.
VALUE: not grown to any extent in Ontario, and not of highest quality.

COLUMBIA.

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DIAMOND (*Black Diamond*).

Considerably grown for cooking purposes.

ORIGIN: Kent, England.

TREE: vigorous; productive; class Domestica.

FRUIT: size large; form oval; suture distinct, shallow; stem three-quarters of an inch long in a narrow, deep cavity; dots small; color dark purple with pale blue bloom.

FLESH: cling; color deep yellow; texture coarse grained, dry; flavor brisk acid.

QUALITY: dessert, poor; cooking, good.

VALUE: market, first class.

SEASON: September.

DUANE (*Duane's Purple*).

A good commercial plum, a profitable variety in the Western States.

ORIGIN: Duanesburgh, N.Y.

TREE: vigorous, productive.

DUANE.

FRUIT: very large; form oblong, oval longer on side; color reddish purple with lilac bloom, turning dark blue; stalk slender, three-quarters of an inch long set in a narrow cavity.

FLESH: color yellow; texture tender, juicy; flavor moderately sweet and good; partial cling stone.

SEASON: late August to early September.

QUALITY: cooking, good.

VALUE: market, first class.

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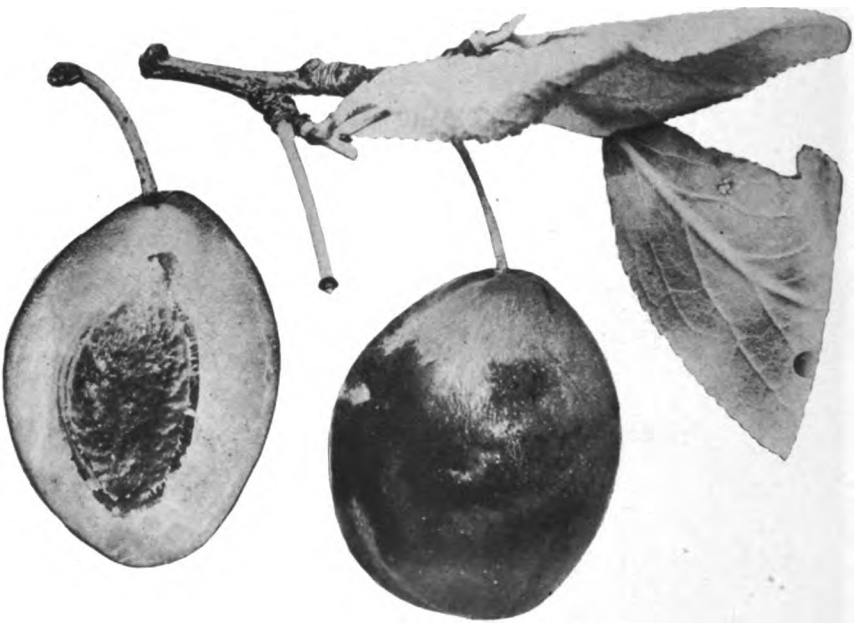
GERMAN PRUNE.

Highly valued for shipping to distant markets because it keeps and carries well; valued also for drying and preserving.

ORIGIN: Germany; widely grown over Europe.

TREE: fairly vigorous; productive; may be propagated from seed without much variation.



GERMAN PRUNE.

FRUIT: size medium, sometimes below; form long oval, sides unequal, elongated; suture distinct; stem three-quarters of an inch long, curved, inserted without cavity; color purple, with blue bloom.

FLESH: free from pit; color yellowish green; texture firm; flavor sweet, pleasant, not rich.

QUALITY: dessert, poor; drying, good.

VALUE: near market, first class; distant market, first class.

SEASON: September and October.

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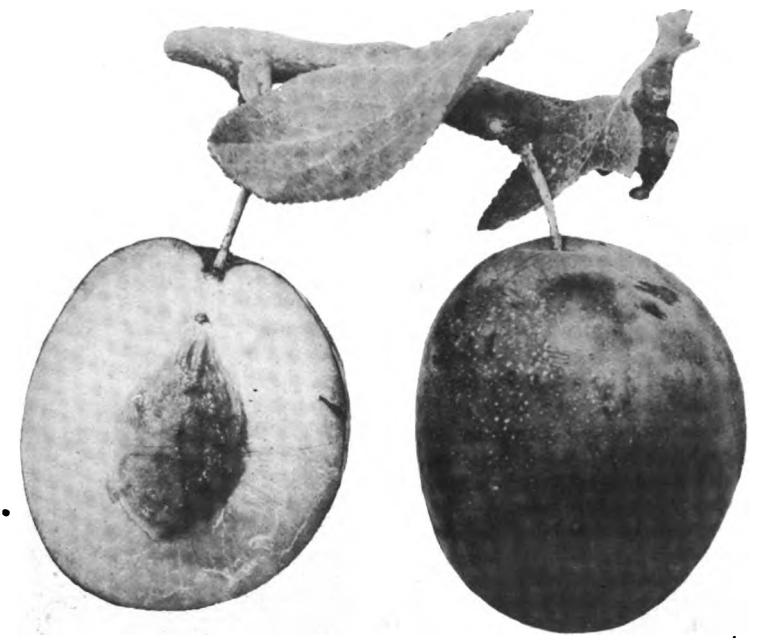
GLASS (*Glass' Seedling*).

A commercial variety resembling Quackenboss.

ORIGIN: with Alexander Glass, at Guelph, Ontario.

TREE: hardy; vigorous; habit upright; foliage peculiar dark green; productive; class Domestica.

FRUIT: size large; form round oval, irregular at apex; suture distinct; apex depressed; stem three-quarters to one inch long; color dark purple with thin blue bloom and white dots; skin thick, firm.



GLASS.

FLESH: free from pit; color greenish yellow; texture juicy; flavor sweet and agreeable.

QUALITY: dessert, fair; canning, good.

VALUE: market, good.

SEASON: September.

GOLD.

A very attractive plum, because of its golden yellow color, but not recommended for the commercial orchard.

ORIGIN: a hybrid of Chicasaw and Japan, originated by H. A. Terry, of Crescent, Iowa.

TREE: a poor grower, but an early and abundant bearer.

FRUIT: large roundish; color golden yellow, with a blush of light red about the stem; stem three-quarters of an inch in length; skin tough.

FLESH: yellow; texture tender and juicy; flavor sweet, aromatic, and pleasant; cling stone.

QUALITY: dessert, fair.

VALUE: market, second class.

SEASON: late August.

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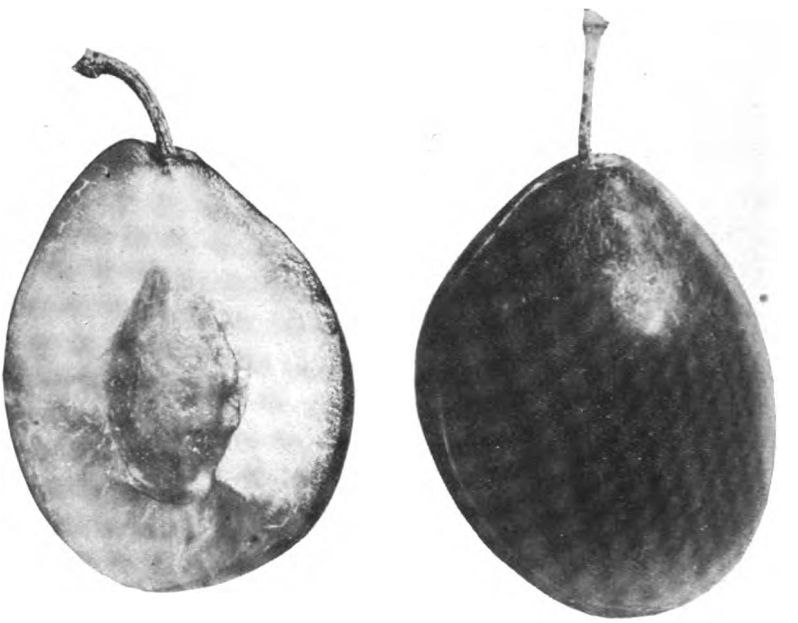
GRAND DUKE.

A valuable market plum, on account of its large size and handsome appearance.

ORIGIN: Europe.

TREE: healthy; moderately vigorous; quite productive.

FRUIT: size large; form obovate; color dark blue or black with dark blue bloom; stem about one inch long, in a small cavity; suture deep.



GRAND DUKE.

FLESH: color yellow; texture firm flavor agreeable; cling.

VALUE: one of the best late market plums.

SEASON: late September.

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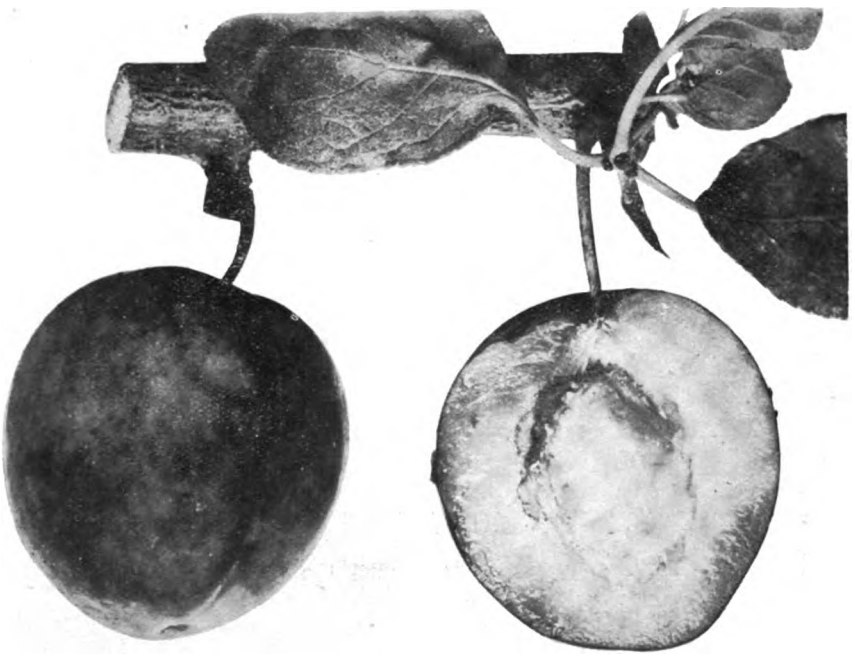
GUEII (*Blue Magnum Bonum*).

A valuable plum for the commercial orchard.

ORIGIN: with Mr. Hagaman, Lansingburgh, N.Y., about 1850. It was named after John Goeway (pronounced Gueii), who was the first to cultivate the plum extensively, and it has of late been spelled after the pronunciation.

TREE: an upright, vigorous grower, becoming more spreading with age; hardy; an early and abundant bearer.



GUEII.

FRUIT: size medium to large; form roundish ovate, narrowing slightly toward apex; color very dark purple, with blue bloom; stem one and a half inches long, slender, set in a large, deep cavity; suture very slight; apex a small point.

FLESH: color pale yellow; texture firm, juicy; flavor, moderately sweet, pleasant; almost free of stone.

QUALITY: dessert, poor; canning, very good.

VALUE: home market first class.

SEASON: late August to early September.

HALE.

A yellow Japan plum coming in between Abundance and Burbank.

ORIGIN: Japan; imported by Luther Burbank in 1885; named after the introducer, Mr. J. H. Hale.

TREE: very vigorous; habit spreading; very productive in 1905.

FRUIT: size rather above medium; form globular; suture traceable on one side; color of skin orange, with thin whitish bloom; stem slender, three-quarters of an inch in length; drops easily.

FLESH: color golden yellow; texture tender, juicy; flavor rich, pleasant; cling.

QUALITY: dessert, good; canning, very good.

VALUE: market, second class. Not grown in Ontario.

SEASON: mid to late August.

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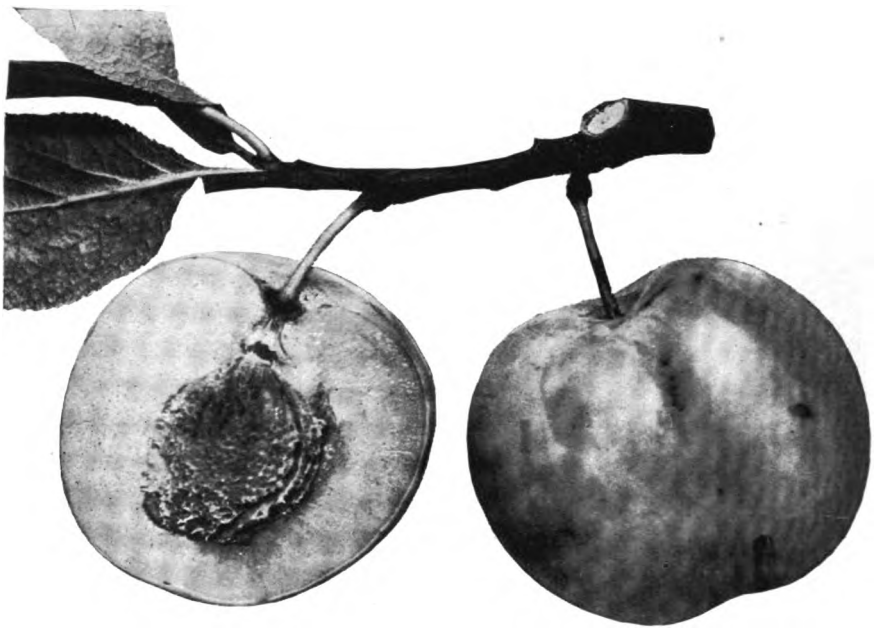
HAND (*General Hand*).

A very fine, large plum of the Gage group, which is worthy of a place in the amateur's garden as a dessert or preserving plum, but not profitable as a market variety.

ORIGIN: on farm of General Hand, Lancaster, Pennsylvania.

TREE: a very vigorous grower, but a shy bearer until well aged; class Domestica.

FRUIT: round; size medium to large; skin deep golden yellow, marbled with greenish yellow; stem slender, about an inch long, inserted in a shallow cavity; suture shallow.



HAND.

FLESH: color pale yellow; texture coarse, moderately juicy; flavor sweet and very good; free from stone.

QUALITY: very good for dessert.

VALUE: market, first class.

SEASON: September.

HAMMER.

"Fruit round oval; size medium to large; cavity very shallow; suture a line; color crimson; dots many, minute, and a few larger yellow; bloom blue; skin thick; flesh yellow; stone small, round, slightly flattened, nearly free; quality very good; season after Wolf and Weaver. Originated with H. A. Terry, Iowa, who says it is a seedling of Miner, but thinks it has an admixture of Americana blood. A fine variety." (*Waugh.*)

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HAWKEYE.

Fruit: large, roundish; cavity shallow, narrow; suture merely a distinct line; apex rounded; color yellow, more or less covered with purplish red dots, small, indistinct; bloom medium; skin thick, moderately tough.

Hawkeye.

Flesh: deep yellow, juicy; stone large, broad, much flattened, cling; sweet, good flavor.

Quality: good.

Season: mid to late September. One of the best. (*Macoun.*)

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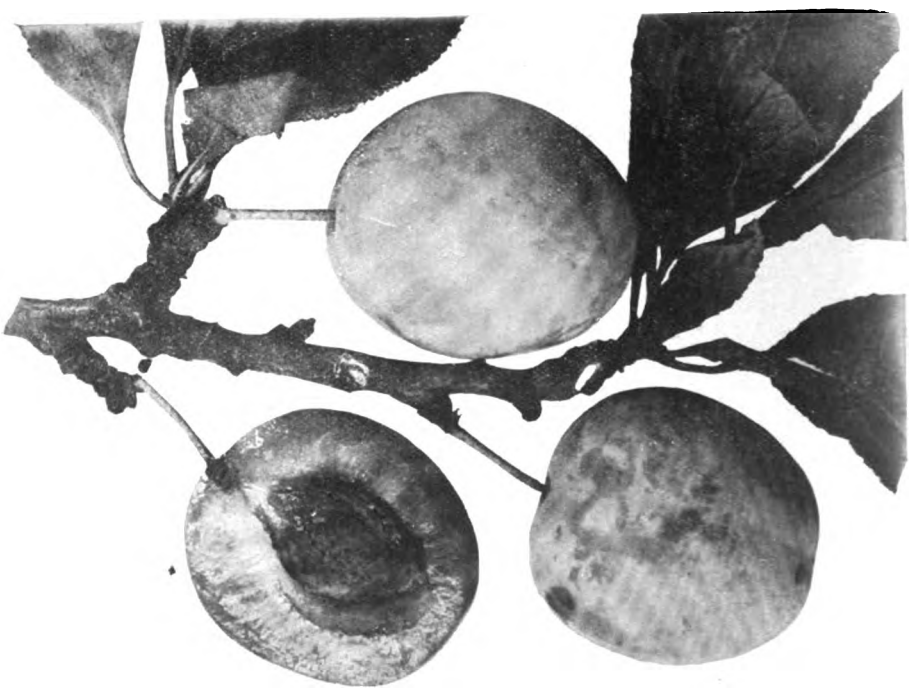
IMPERIAL GAGE.

An excellent preserving or canning plum, but not very popular for the commercial orchards.

ORIGIN: Flushing, Long Island.

TREE: vigorous; productive; hardy; class Domestica.

FRUIT: size medium or below; form oval; color green tinged with yellow; dots greenish; bloom whitish; stem three-quarters of an inch long; suture shallow; skin tough.



IMPERIAL GAGE.

FLESH: mostly free; color greenish yellow; texture juicy, melting; flavor rich, excellent.

QUALITY: dessert, very good; canning, best.

VALUE: market. first class.

SEASON: early September.

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ITALIAN PRUNE (*Fellenburg*).

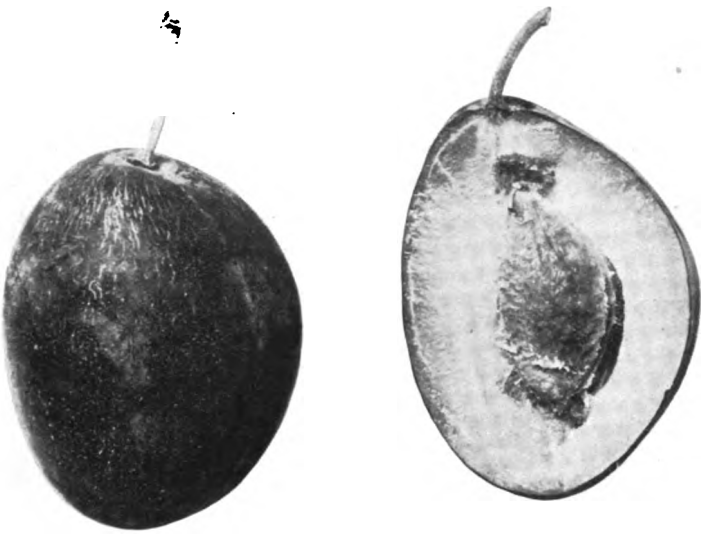
An old variety from Europe; a fine late shipping plum, and widely grown for market.

ORIGIN: Europe.

TREE: of spreading habit; productive; class Domestica.

FRUIT: size medium; form oval narrowing at the ends, one sided; stem one inch long in small cavity; suture shallow; skin thin; color dark purple with blue bloom.

FLESH: free stone; color greenish yellow; texture fairly juicy; flavor sweet, good.



ITALIAN PRUNE.

QUALITY: dessert, fair; cooking, very good.

VALUE: market, first class.

SEASON: September.

KINGSTON.

A valuable market variety.

ORIGIN: Province of Ontario.

TREE: vigorous and productive.

FRUIT: size medium to large; form oval; color dark purple, with thin blue bloom; stem slender, about five-eighths of an inch long, inserted in a small, deep cavity; suture shallow; apex a small point.

FLESH: color yellowish green; flavor tart.

QUALITY: cooking, very good.

SEASON: early September.

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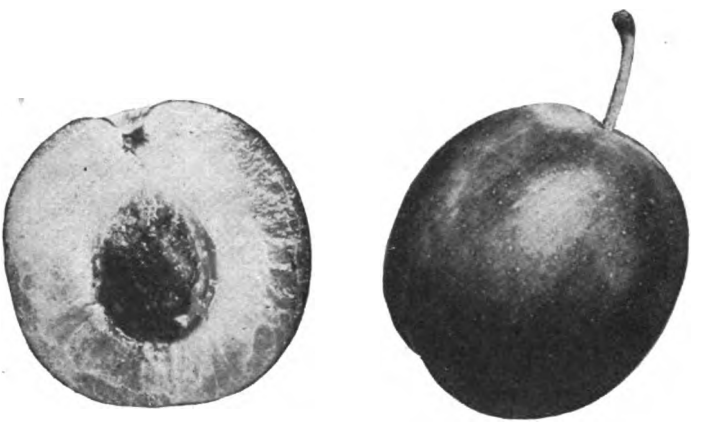
LOMBARD.

One of the most prolific of the old varieties, and, until recently, considered the most profitable. Of late, however, the price of Lombard plums has so far declined that other varieties are being planted in its place.

ORIGIN: raised from seed by Judge Platt, Whitesboro, N.Y.; introduced to public by M. Lombard, of Springfield, Mass., after whom it was named. Previously it was called Bleeker's Scarlet.

TREE: very productive; very vigorous; very hardy; inclined to overload, and the fruit needs thinning.



LOMBARD.

FRUIT: medium size; form roundish, oval, slightly flattened at the ends; color purplish red, paler in shade; bloom heavy; suture traceable; stalk slender, about three-quarters of an inch, set in a broad, funnel-shaped cavity; subject to rot when overloaded.

FLESH: deep yellow; texture firm, juicy; flavor pleasant; cling stone.

QUALITY: dessert, good; canning, very good.

VALUE: second class for market.

SEASON: late August to early September.

McLAUGHLIN.

A fine plum for home uses; a little tender for distant shipment.

ORIGIN: with James McLaughlin, Bangor, Maine.

TREE: vigorous; fairly productive; an early and an annual bearer; class Domestica.

FRUIT: size medium to large; form roundish oval, flattened at the ends; stem five-eighths of an inch long, in a small shallow cavity; apex, small point in a slight depression; suture traceable; skin thin; color greenish yellow, mottled with red; bloom delicate whitish.

FLESH: semi-cling; pit small; color clear yellow; texture tender, very juicy; flavor rich, sweet and excellent.

QUALITY: dessert, very good to best; cooking, good.

VALUE: market, first class; rather tender for distant shipments.

SEASON: September.

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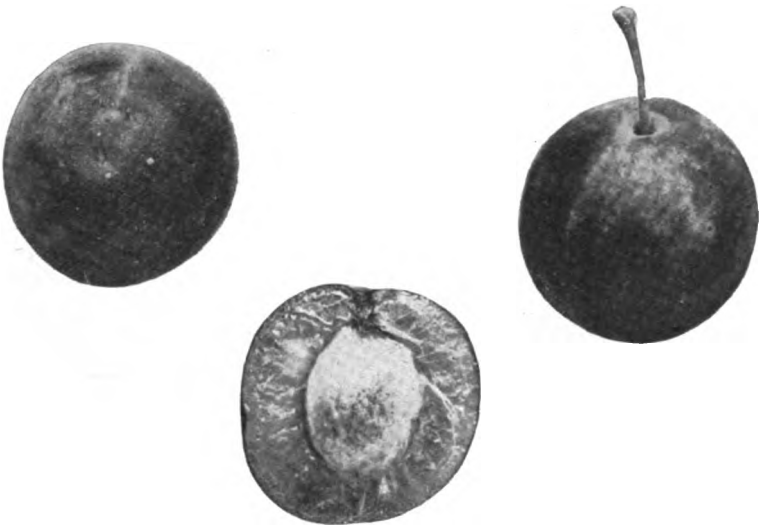
MANKATO.

"Fruit above medium to large, roundish; cavity narrow, medium depth; suture a distinct line; apex rounded; color deep, dull red with a moderately heavy bloom; dots numerous, small, yellow; bloom rather heavy; skin thick, tough; flesh deep yellow, juicy, sweet, good flavor, not astringent; stone large, flat, semi-cling; quality good. Season late August to early September. Better in quality than Bixby, but not as handsome. A good early plum. Promising." (*Macoun.*)



MANKATO.

MARU.

Productive and early, but too small and poor in quality to be recommended.

ORIGIN: imported by L. Burbank in 1885.

TREE: habit spreading; fairly vigorous; very productive.

FRUIT: size small; form roundish; cavity narrow, abrupt; stem short and stout; suture scarcely traceable; bright red, turning dark red; bloom thin.

FLESH: cling; color yellow; texture tender, juicy; flavor pleasant.

QUALITY: dessert, fair; cooking, fair.

VALUE: market, second class.

SEASON: mid-August.

MILTON.

A seedling of Wild Goose; valuable for its hardiness.

ORIGIN: Iowa.

FRUIT: size medium; roundish oval or oblong; color dark red with numerous dots.

FLESH: texture melting, firm.

QUALITY: fair.

VALUE: market, second class.

SEASON: a week earlier than Wild Goose.

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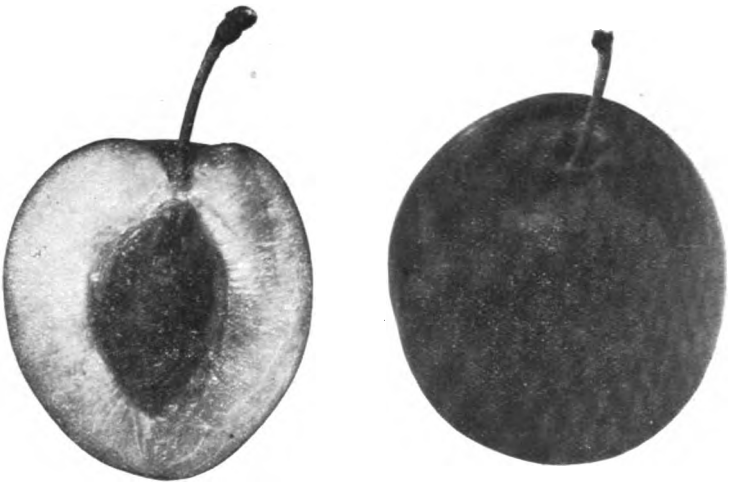
MONARCH.

A profitable commercial variety; a good shipper.
ORIGIN: England.
TREE: a vigorous grower; habit upright; an early, regular and abundant bearer; class Domestica.

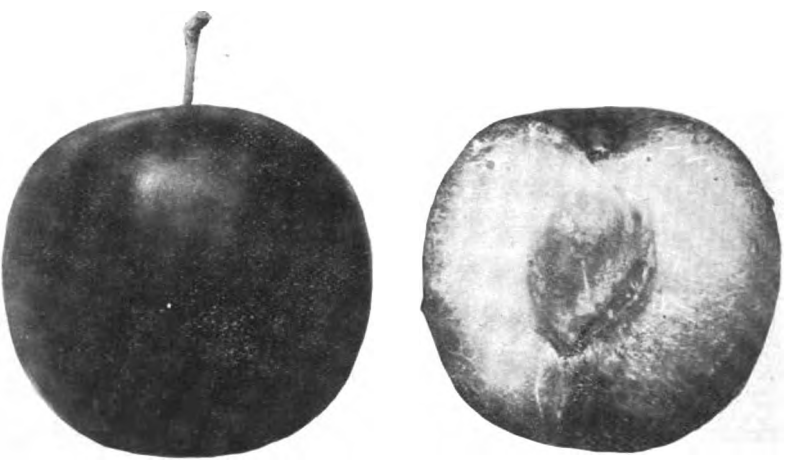


MONARCH.

FRUIT: large; roundish ovate; color dark purple with heavy bluish bloom; stalk about seven-eighths of an inch long, stout, in a moderately deep cavity; suture broad, shallow.
FLESH: color yellow; texture firm; flavor sweet, slightly acid.
QUALITY: very good for all purposes.
VALUE: market, first class; canning, first class.
SEASON: late September.

MAYNARD.

A Japanese variety highly advertised, but not much planted in Ontario.
TREE: large, vigorous, spreading, productive.
FRUIT: medium size, roundish, dark and changing to purplish black.
FLESH: reddish, tender, sweet and aromatic.
VALUE: good.
SEASON: early, follows Climax.



MAYNARD.

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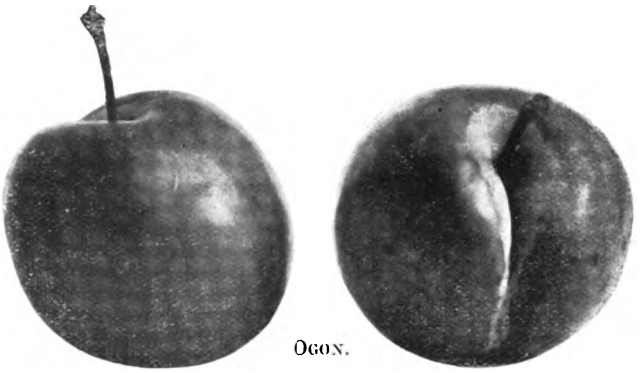
OGON.

Somewhat irregular in size, but its earliness, just following Red June and Willard, make it of value to the plum grower.

ORIGIN: imported from Japan by H. H. Berger & Co., California.

TREE: class, Japan; habit, spreading; fairly vigorous; fairly productive.



OGON.

FRUIT: form roundish, irregular; size medium; color yellow; bloom slight, whitish; stem half an inch long in a deep, narrow cavity; suture deep or shallow, half round; apex blunt.

FLESH: free; color yellow; texture firm with a little juice; flavor flat.

QUALITY: poor for dessert; fair for cooking.

VALUE: market, first class.

SEASON: mid-August.

POND (*Pond's Seedling*).

A beautiful and showy plum, but not much planted in the commercial orchard; somewhat subject to rot.

ORIGIN: England.

TREE: vigorous; moderately productive.

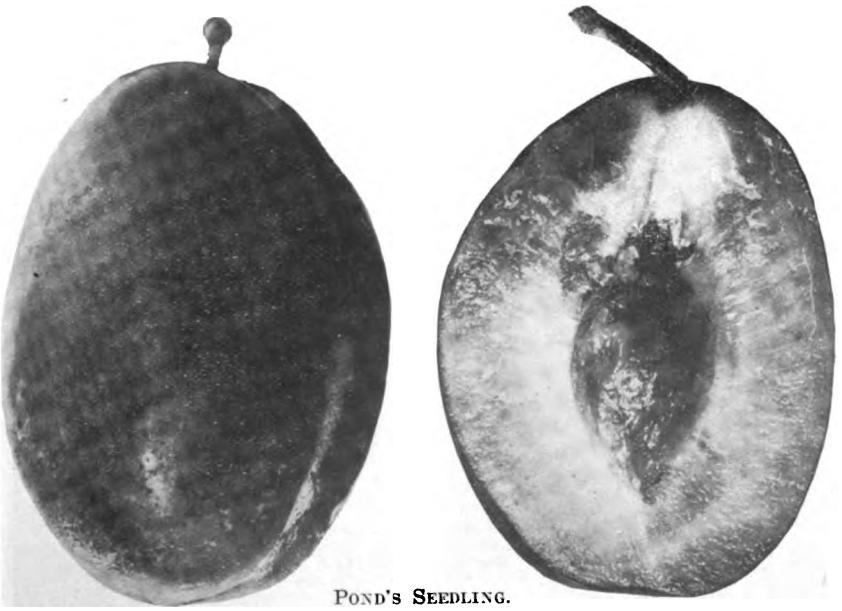
FRUIT: size very large; form obovate tapering toward the base; skin thick, purple, with purplish bloom and numerous brown dots.

FLESH: color yellow; texture juicy; flavor pleasant.

QUALITY: very good.

VALUE: market first class, only for its susceptibility to rot.

SEASON: mid-September.



POND'S SEEDLING.

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PRUNE D'AGEN.

"Medium in size obovate, somewhat necked; color reddish purple with heavy blue bloom and numerous small dots; stalk one inch long, curved, in small cavity. Flesh greenish yellow, rich, very good to best; nearly free from pit. Grown largely on the west coast for drying, but in States to the east and south to a less extent. Domestica." (*Budd.*)

PURPLE EGG (*Hudson River Purple Egg*).

A good commercial variety, especially for preserving.

ORIGIN: on the banks of the Hudson River, New York State, exact locality not known.

TREE: upright, vigorous grower, hardy and very productive.

FRUIT: size large; form ovate, often necked; color of skin, dark, rich red to purple; stem long in a deep cavity; suture shallow; bloom thin; clings to stone.

FLESH: color, greenish yellow; texture firm; flavor brisk acid.

QUALITY: dessert, poor; cooking, very good.

SEASON: late September.

PRINCE OF WALES.

TREE: large, vigorous, slightly vasiform, open-topped, hardy, very productive.

FRUIT: late, season short; one and five-eighths inches by one and one-half inches in size, roundish oval, halves equal; cavity narrow, abrupt; suture a line; apex roundish; color reddish purple, overspread with thick bloom; dots few, large, often tinged red, conspicuous; stem thick, one-half inch long, pubescent, adhering well to the fruit; skin tough, separating readily; flesh golden yellow, juicy, tender, sweet, mild; good; stone semi-free or free, seven-eighths inch by five-eighths inch in size.

PRINCE OF WALES.

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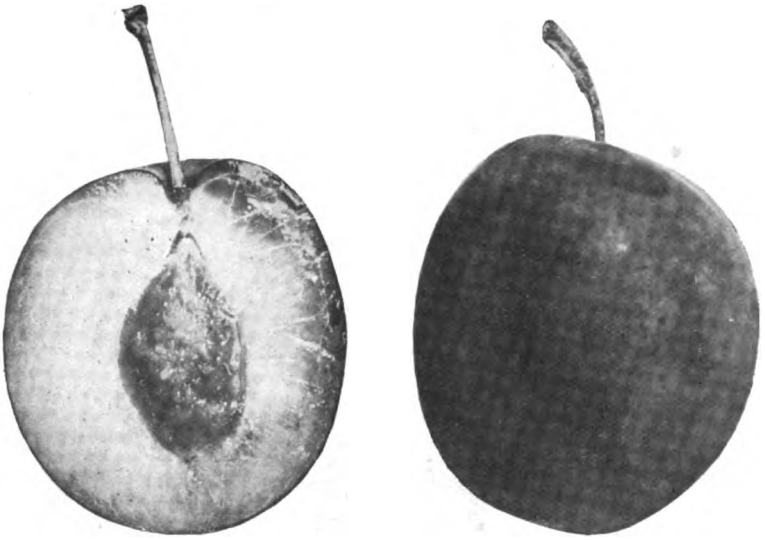
QUACKENBOSS.

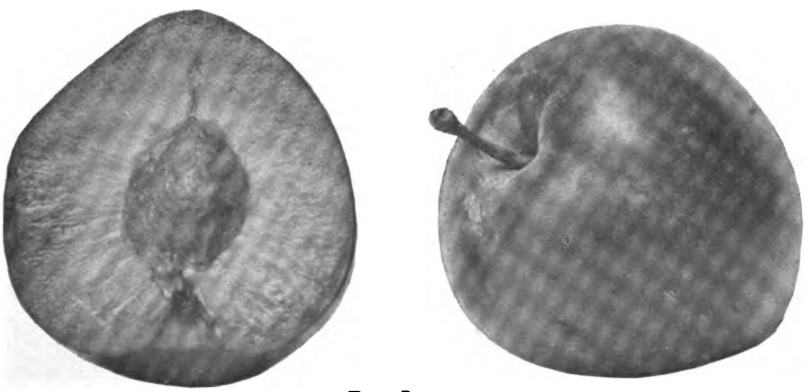
A good market plum; one of the best for distant shipment.
ORIGIN: at Albany N.Y.; introduced by Mr. Quackenboss, of Greenbush, N.Y.
TREE: very vigorous; habit upright; hardy; fairly productive.



QUACKENBOSS.

FRUIT: large; form roundish oval; color dark purple, with blue bloom; stem of medium length, set in a very slight cavity; suture traceable.
FLESH: semi-cling; color greenish; texture rather firm; flavor sprightly.
QUALITY: dessert, fair; canning, good.
VALUE: market, first class.
SEASON: late September.

RED JUNE (*Red Nagate of Thomas*).



RED JUNE.

The earliest good plum grown.

ORIGIN: Japan; introduced to the public in 1893 by Stark Bros., Louisiana, Mo., who gave it the name of Red June. The Japanese name was "Shiro Smomo."
TREE: hardy and vigorous, forming a symmetrical top; an early and fairly abundant bearer; should be planted with such varieties as Burbank, Abundance or Chabot, to secure cross fertilization.

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FRUIT: form, roundish conical; apex pointed; size, medium; suture distinct; skin thick, tenacious; color bright red, deepening to dark red when fully ripe, with light bluish bloom; stem one-half an inch long; cling.

FLESH: color yellow; texture somewhat juicy, moderately firm; flavor agreeable.

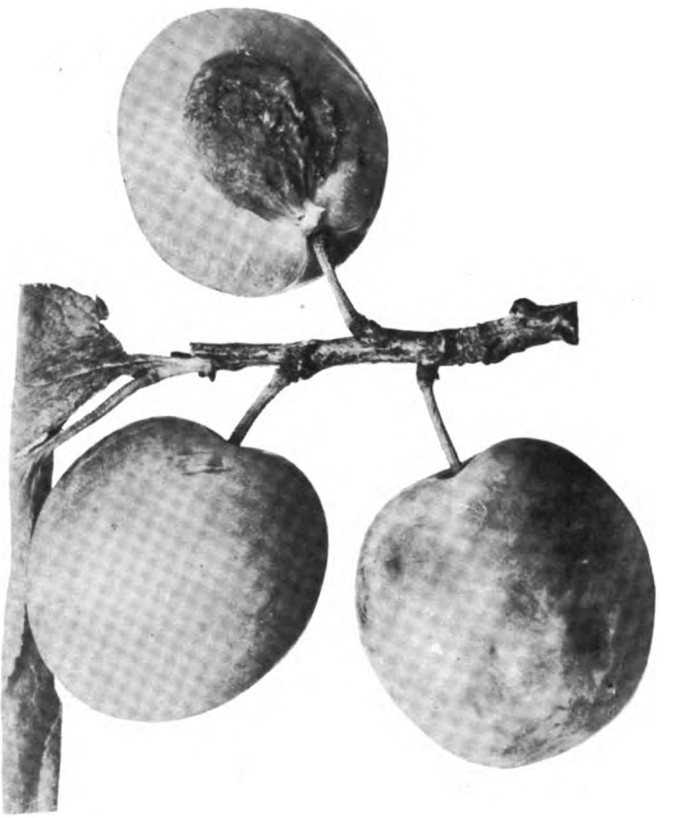
QUALITY: dessert, good; cooking, very good; an excellent substitute for the Damson.

VALUE: market, first class. The earliest plum of value on early locations.

SEASON: late July to early August.

REINE CLAUDE (*Reine Claude de Bavay. Green Gage*).

The Reine Claude and several varieties of the Green Gage type are of especial value for culinary purposes. For pies, sauce or canning purposes they seem to be growing in demand year after year and no collection of plums for the home garden is, therefore, complete without a tree or more of this or some other variety of this family. With Ontario fruit growers, the most popular Gage is the Reine Claude de Bavay, commonly known among them as Reine Claude, which name is also an old synonym of the Green Gage. In the catalogue of the American Pomological Society it is called Bavay. The fruit of this later variety is in good demand among canners, and brings a fair price in our markets.



REINE CLAUDE.

ORIGIN: this type of plum was brought from Italy to France about the year 1500 by Queen Claudia, wife of Francis I., after whom it was named Reine Claudia. Later, some trees were brought to England by a family named Gage, but the label on these trees being lost, the gardener called them Green Gage. Hogg, the English pomologist, however, tried to prove that this plum had been introduced into England before this time under the name of Reine Claude, and hence arose considerable confusion of names.

TREE: productive; hardy, a slow grower.

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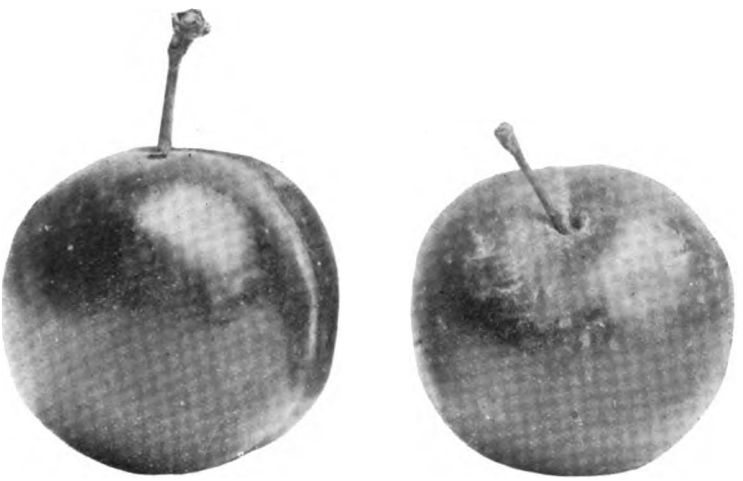
FRUIT: roundish; size medium; skin greenish, yellowing towards maturity, with a thin whitish bloom and a few red dots; stem three-quarters of an inch long, set in a small, abrupt cavity; suture traceable.
FLESH: color pale green; texture melting and juicy; flavor rich, sweet and excellent; pit mostly free.
QUALITY: cooking or canning, best; dessert, very good.
VALUE: home market, first class.
SEASON: mid to late August.

SATSUMA (*Blood*).

One of the most satisfactory of the Japan plums; commercially valuable in the Niagara district. Highly esteemed for canning, and for jelly.
ORIGIN: imported by Luther Burbank from Japan to America in 1886; called "Blood" from the blood-red color of the flesh.
TREE: habit spreading; fairly vigorous; ordinarily very productive; self sterile, and should be planted with other varieties.



SATSUMA.

FRUIT: oblate, slightly conical; size large; stem about three-quarters of an inch in length, stout, set in a deep cavity; suture traceable; skin thick; color dark red, with whitish bloom and many dots.
FLESH: cling; color dark red; texture firm; flavor pleasant when well ripened; a little acid.
QUALITY: cooking, very good.
VALUE: market first class.
SEASON: late September.

SHIPPERS' PRIDE (*Pride*).

An excellent market plum; a good shipper and fine for canning;
ORIGIN: New York State.
TREE: very vigorous; very hardy; very productive.
FRUIT: size large; form roundish oval; color dark purple.
FLESH: firm, juicy; flavor sweet.
QUALITY: dessert fair; cooking, good; excellent for canning
VALUE: market, first class, being a fine shipper.
SEASON: early to mid-September.

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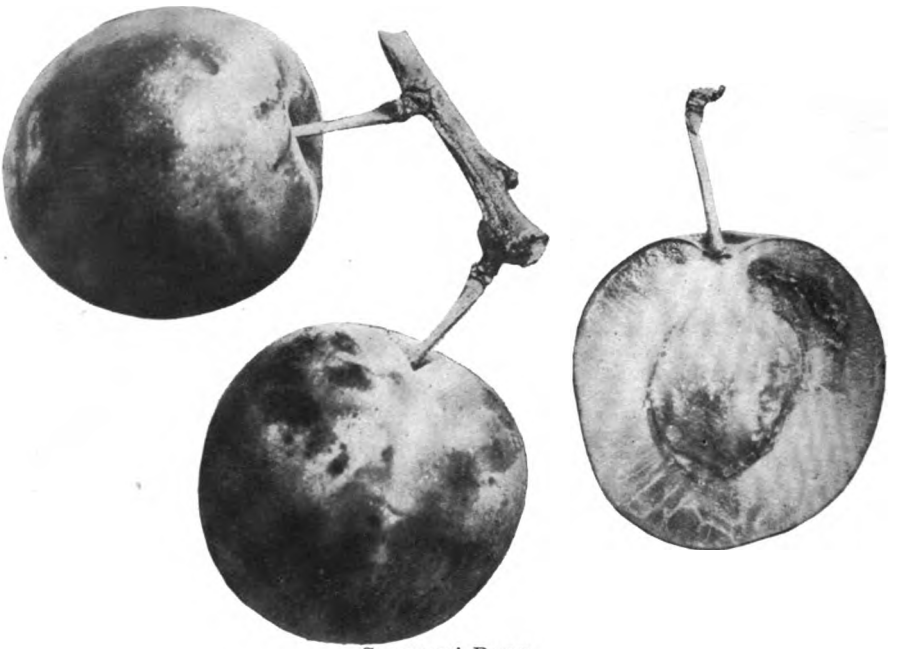
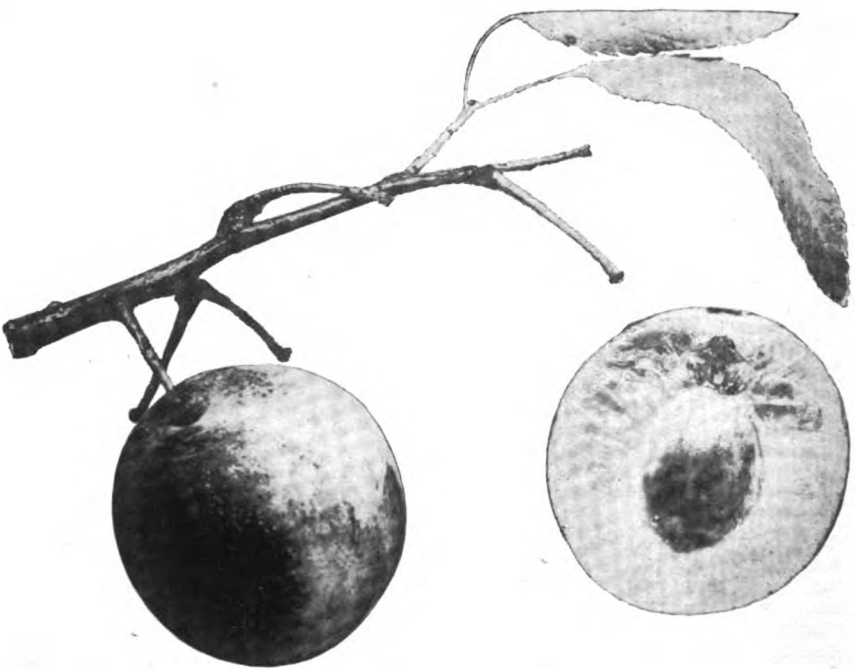


SHIPPERS' PRIDE.

SCHLEY.

FRUIT: of medium size, roundish oval; suture slight; cavity of medium depth; bright red with numerous dots; skin tough; flesh yellow; poor; cling stone; mid-season.



SCHLEY.

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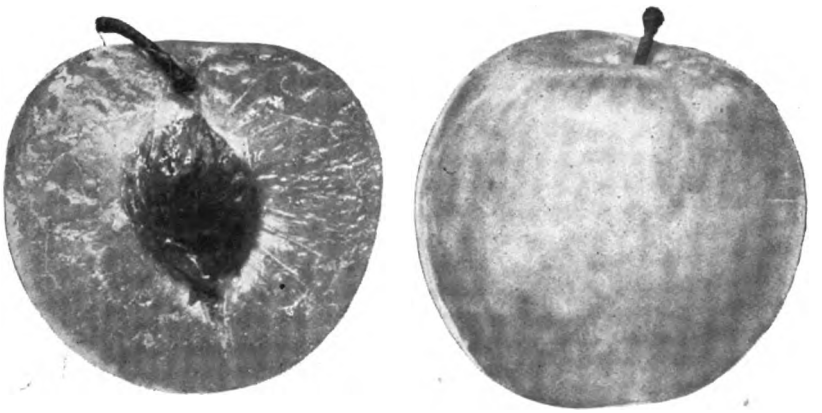
SHIRO.

FRUIT: very early, season short; one and one-half inches in diameter, roundish conic, with halves equal; cavity intermediate in depth and width; suture an indistinct line; apex roundish; color light yellow, becoming deeper yellow as the season advances, occasionally with a blush of pink, with thin bloom; dots numerous, very minute, whitish, inconspicuous; stem three-eighths inch long, adhering to the fruit; skin. thin, tough,



SHIRO.

sour, occasionally cracking, separating readily, although a thin coating of flesh is left clinging to the skin; flesh light yellow, semi-transparent, the stone being faintly visible, very juicy, fibrous, somewhat melting, sweet, mild, lacks character in flavor; good; stone clinging, seven-eighths inch by five-eighths inch in size.

SHROPSHIRE DAMSON.

A small plum, very highly valued for jam and for preserves; much sought after by those who know its value.

ORIGIN: Shropshire, England.

TREE: upright, fairly vigorous, quite productive.

FRUIT: small, oval; color dark purple, with blue bloom; stalk half an inch long, no cavity; suture none.

FLESH: nearly free from stone; texture melting, juicy; flavor rich, acid.

QUALITY: dessert, fair; canning, very good to best.

VALUE: market, first class.

SEASON: late.

SIMON (*Prunus Simoni, Simonsi of Thomas, Simon's Plum*).

A distinct species of stone fruit, having characteristics of both the peach and the plum. It has been tested in Ontario since 1888, and has not realized the expectations of planters who were led to expect in this fruit a substitute for the peach where the latter fruit was uncertain. It has proven itself worthless in the commercial orchard, and valuable only as a curiosity.

ORIGIN: northeastern China, introduced to France by Eugene Simon and disseminated by Simon Bros., of Metz, Alsace. Fruited at Cornell University in 1886, and at St. Catharines, Ont., in 1887. It was placed in the plant distribution list by the Fruit Growers' Association in 1890.

TREE: upright, slender, lacking in vigor, not productive.

FRUIT: large; form round transversely and flattened longitudinally; color dark maroon, with a perceptible bloom; stalk half an inch long, stout, set in a deep cavity; suture distinct; stone smooth, clings tightly to the flesh.

FLESH: orange color; texture, tough and juicy; flavor often bitter, sometimes fairly agreeable.

QUALITY AND VALUE: very poor.

SEASON: early August.

ADAPTATION: to the peach sections.

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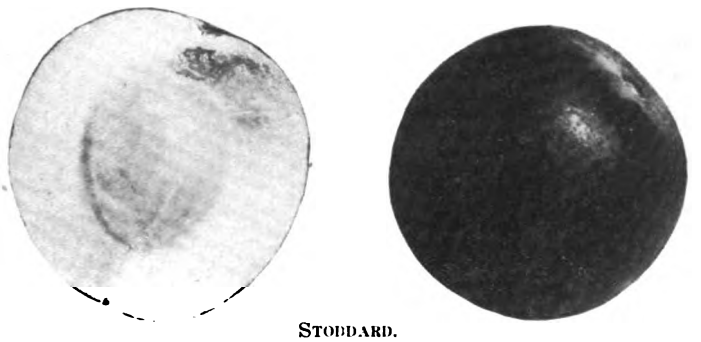
SMITH ORLEANS.

"Fruit large to very large, oval, rather widest toward the stalk, a little irregular, with a strongly marked suture on the side; stalk quite small and slender, a little more than half an inch long, inserted in a deep, narrow cavity; skin reddish purple; covered with a deep blue bloom; flesh deep yellow, a little firm, very juicy, with a brisk rich vinous flavor, and adheres to the stone; good to very good; late August, growth very vigorous." (*Downing.*)

STODDARD.

"Fruit large to very large; roundish; cavity narrow, shallow; suture a distinct line; apex rounded; color deep yellow, almost entirely covered with deep purplish red; dots fairly numerous, small yellow; bloom light, skin thick, tough, slightly astringent; flesh deep yellow, juicy; stone medium size, broad, flat, cling; sweet, good rich flavor; quality very good. Season late September. One of the largest and best flavored Americana plums." (*Macoun.*)



STODDARD.

VICTORIA (*Sharp; Sharp's Emperor*).

A fine dessert plum for the amateur's garden. It has been long known as Victoria, and indeed by no other name in Ontario.

ORIGIN: Sussex, England.

TREE: vigorous and productive.

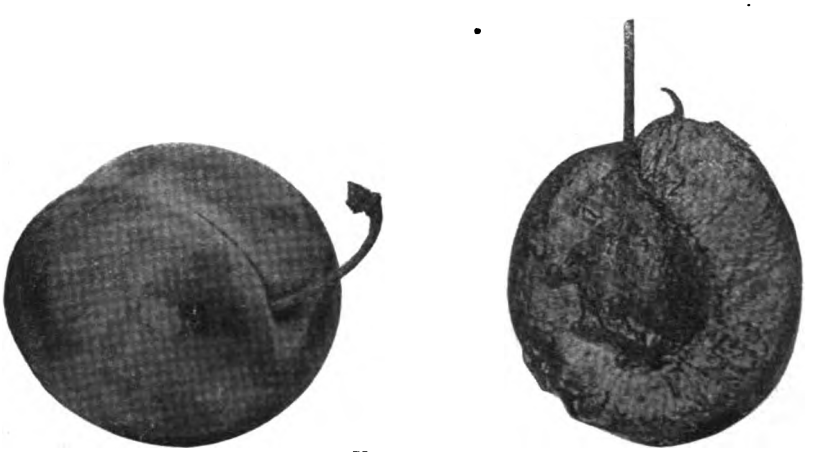
FRUIT: size large, form oval; suture distinct; color of skin light reddish-purple; stem nearly one inch long in a moderately deep, abrupt cavity; dots whitish and pinkish; cling stone.

FLESH: yellow; flavor pleasant.

SEASON: early in September.

QUALITY: very good.

ADAPTATION: considered a success at the Lake Huron station, in Bruce County.



VICTORIA.

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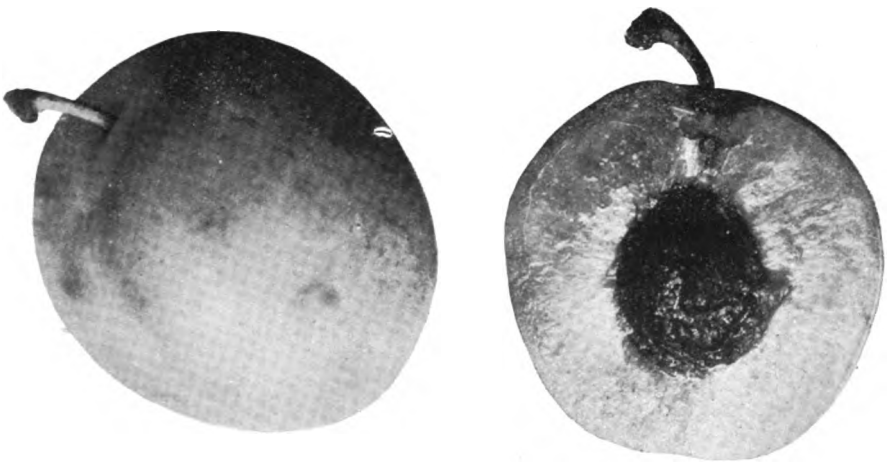
WASHINGTON.

Not productive enough, nor good enough a shipper to be popular in the commercial plum orchard; but, on account of its large size, beauty and excellence of quality, a universal favorite for the dessert table.

ORIGIN: New York City, as a sucker from a grafted tree, which was purchased from a market woman by a Mr. Balmer. He first fruited it in 1818, and the plum was at first called Balmer, after him.

TREE: a strong, vigorous grower; fairly productive; foliage remarkably large, broad and glossy.

FRUIT: size large; form round oval; suture traceable, very distinct near the stem; color dull yellow, changing to deep yellow, marked with crimson dots and covered with pale bluish, grey bloom; stem three-quarters of an inch long, set in a wide, shallow cavity.



WASHINGTON.

FLESH: yellow; texture firm; flavor rich, sweet and luscious.
QUALITY: dessert, very good; cooking, very good.
VALUE: home market, first class.
SEASON: late August.

WHITAKER.

The best of its class fruited at the St. Lawrence station.

ORIGIN: a seedling of Wild Goose; raised by J. T. Whitaker, Texas; closely resembling its parent.

TREE: vigorous; rapid grower; spreading habit; healthy; foliage bright green, free from shot-hole fungus; late bloomer; class Chickasaw.

FRUIT: oval; size medium; cavity shallow; suture traceable; color bright red, with many white dots and thin bluish bloom; skin thin.

FLESH: color yellow; texture moderately firm, juicy; flavor sweet and good.
QUALITY: good.
VALUE: market, second class.
SEASON: September.

WICKSON.

Among the largest and finest of the Japan plums, but not productive enough to be profitable as a market variety. Introduced with a great flourish and largely planted, but in most cases it has proven a disappointment.

ORIGIN: grown from seed of Kelsey, by Luther Burbank, of Santa Rosa, Cal.; from its habit the tree appears to have some relation to Prunus Simoni.

TREE: habit very upright, bearing fruit mostly on fruit spurs; hardy; blooms early and abundantly, but sets very little fruit; should be planted with such productive sorts as Burbank for cross pollination; class Japanese.

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FRUIT: form oblong conical, apex a point; size large to very large; skin thick; color yellow, mostly covered with rich brownish red; bloom thin; stem stout; cavity large, deep, abrupt; suture very decided from base to apex.

FLESH: semi-cling; color yellowish, translucent with yellow veins; texture firm for shipment, but tender and juicy when fully ripe; flavor sweet, rich, aromatic.

QUALITY: very good for all purposes.

VALUE: market, first class. Not prolific enough in Ontario.

SEASON: mid-September.

WILD GOOSE.

"Fruit oval; size medium to large; cavity shallow; stem medium long; suture a line; color bright, clear red; dots many, white, conspicuous; bloom thin, bright bluish; skin thin, but rather tough; stone small to medium, oval, pointed, cling; flavor sweet; quality fair to good; season early; origin Columbia, Tennessee." (*Waugh.*)

WILLARD.

A profitable market plum on account of the early season of ripening its fruit, but too poor in quality to receive much commendation, and not very productive.

ORIGIN: Japan.

TREE: vigorous; rather spreading in habit; fairly productive.

FRUIT: size medium, sometimes above; form roundish oblong; color greenish, partly overspread with dull red; suture clearly traceable; apex elevated, not pointed; bloom thin, whitish.

FLESH: yellowish; moderately firm; not very juicy; semi-cling; flavor poor.

QUALITY: dessert poor; cooking fair.

VALUE: first class in its season for market.

SEASON: early August.

WOLF.

"Fruit large, roundish; cavity narrow, shallow; suture shallow, fairly distinct, not depressed; apex rounded; color deep red; dots fairly numerous, small, yellow, distinct;

WOLF.

bloom moderate; skin thick, tough; flesh deep yellow, juicy, sweet, rich, good flavor; stone above medium size, outline oval, considerably flattened, cling; quality good; season early to mid-September. One of the best." (*Macoun.*)

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WYANT.

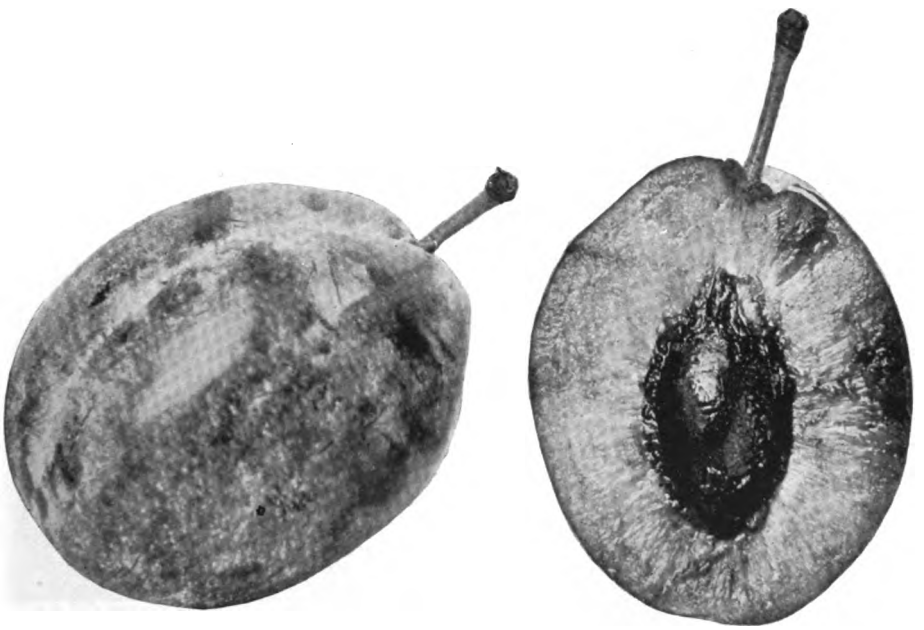
"Fruit large, oblong, flattened; cavity narrow, deep; suture a distinct line; apex almost pointed; color deep red; dots numerous, small, purple; bloom medium; skin rather thick, somewhat tough, astringent; flesh deep yellow, moderately juicy; fairly sweet; stone large, much flattened, oval, semi-cling, almost free; quality medium. Season mid-September. Quality not good enough. This plum is highly recommended in the Western States, but has not proven so good as some others here (Ottawa)." (*Macoun.*)

YELLOW EGG (*White Magnum Bonum*).

A profitable commercial variety, on account of its large size and fine appearance, but susceptible to the plum rot and inclined to drop before maturity. Good for canning purposes.

ORIGIN: Europe.

TREE: vigorous, spreading, and very productive.



YELLOW EGG.

FRUIT: size large to very large; form egg shaped with distinct suture on one side; skin thick, adherent to flesh; color yellow with whitish bloom; stalk nearly an inch long, inserted in a small cavity, with a fold about its base; pit long, pointed, cling.

FLESH: yellow; texture firm, juicy, coarse; flavor subacid, becoming sweet when very ripe, but ordinary.

QUALITY: dessert, poor; cooking, good.

VALUE: home market, first class.

SEASON: late August.

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THE QUINCE

As there is only a limited demand for quinces in Canada, this fruit is not largely grown. It is somewhat tender, but can be grown commercially wherever the peach succeeds. Some quinces are, however, produced for home consumption as far east as the Bay of Quinte.

The culture of the quince is somewhat similar to that of dwarf pears. The soil most suitable is a friable clay loam, well drained. Three year old trees are planted from fourteen to fifteen feet apart each way. The trees are pruned with a somewhat open top as the dwarf pear, the head starting from near the ground. If the trees make rapid growth severe heading-in should be practised to get stockier trees and to have the fruit better distributed. Good cultivation is necessary in the production of the quince, as with other fruits.

The quince makes a handsome ornamental tree where it can be grown, the abundant white bloom in the spring and the golden fruit in the autumn rendering it a striking object wherever planted.

VARIETIES RECOMMENDED.

General List, approved by the Board of Control.

Fuller, Orange (the leading market variety in Ontario), Champion (for Southern Ontario only, as it ripens too late for other sections).

DESCRIPTION OF VARIETIES

BENTLEY.

A variety grown largely for market in Maryland, and in Ontario it is gaining in favor.

TREE: thrifty; productive.

FRUIT: large; form roundish; skin yellow with heavy down.

QUALITY: excellent.

VALUE: market, first class.

SEASON: early October.

CHAMPION.

An American quince of recent origin.

TREE: an upright grower, taller than the Orange.

FRUIT: large, distinctly pear-form, furrowed about the top, generally remaining greenish yellow upon the tree; conspicuously covered with a floccose wool or fuzz.

SEASON: mid-winter.

ADAPTATION: ripens well in Southern Ontario, but would be too late farther north.

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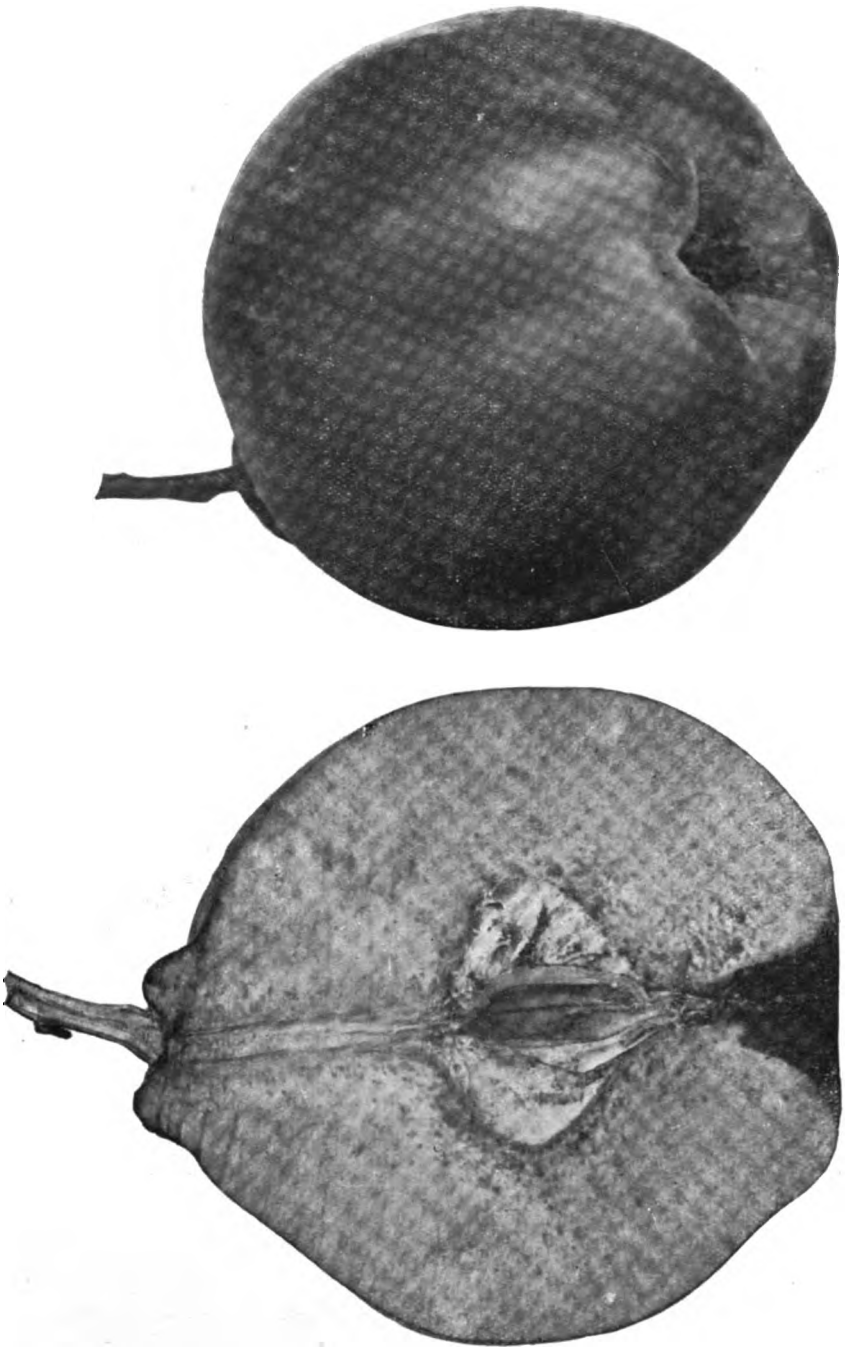

CHAMPION.

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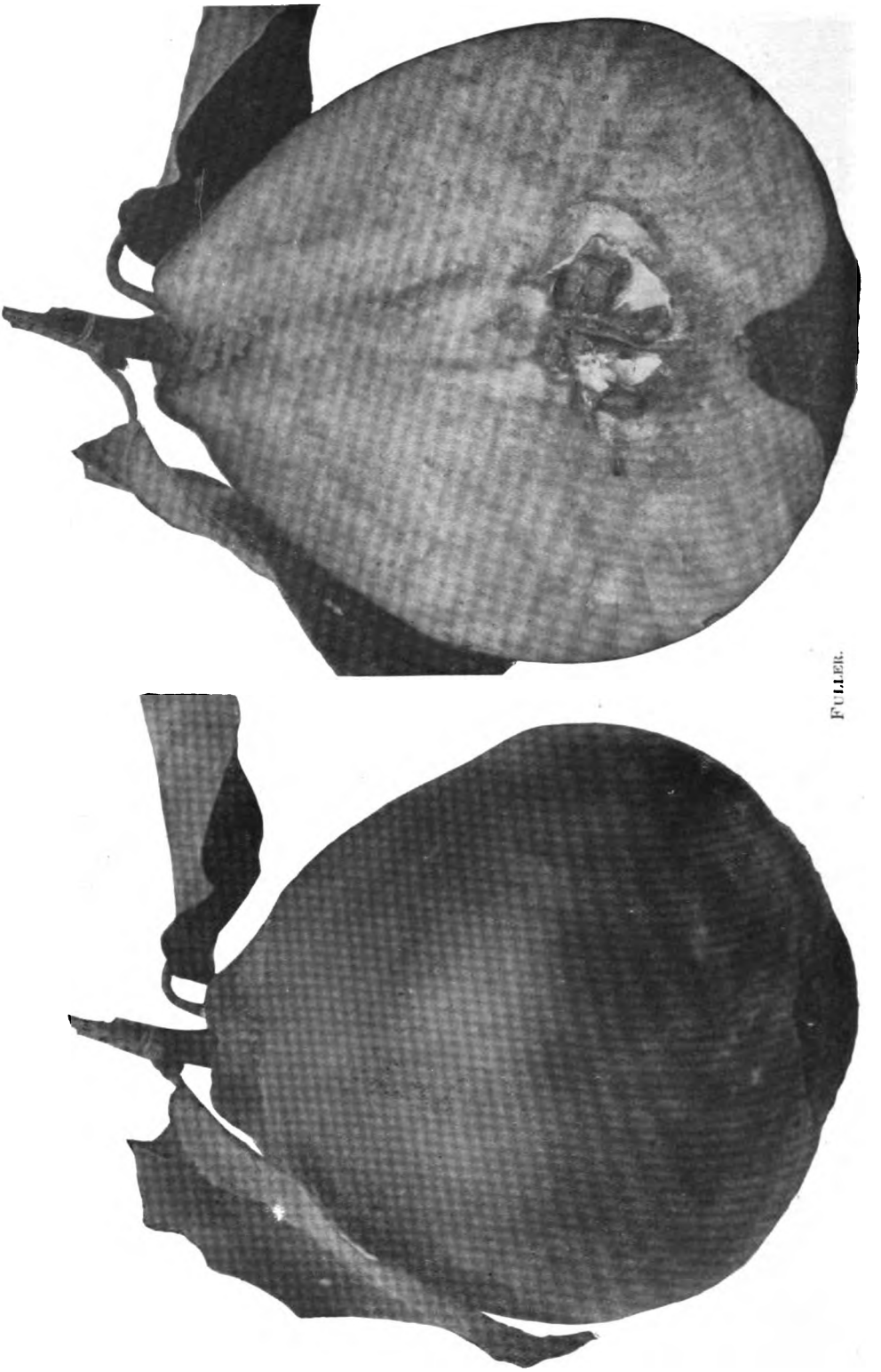

FULLER.

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FULLER.

ORIGIN: named after Mr. A. S. Fuller, of Ridgewood, N.J., who noticed it fruiting on a neighbor's grounds in about the year 1870, took some cuttings and introduced it to public notice.

TREE: a good grower and showy both in fruit and flower.

FRUIT: large; distinctly pyriform in shape, sometimes with an elongated neck, somewhat ribbed; color rich yellow; calyx set in a deep, wide basin.

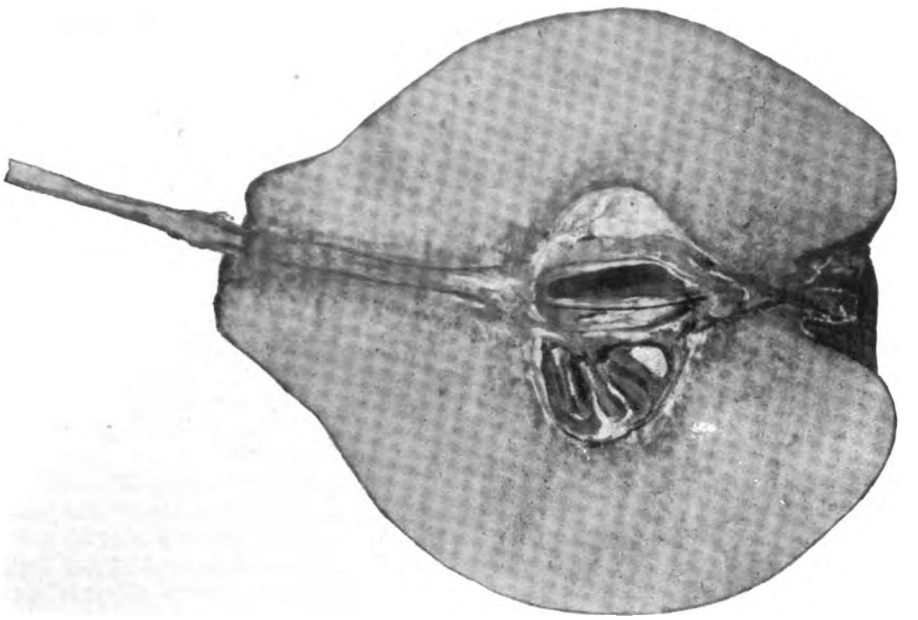
FLESH: tender in texture; flavor good.

VALUE: market, first class.

SEASON: late September.

ORANGE (*Apple*).

The leading market variety of quince in Canada. Previous to 1870, this and the Angers were the only varieties of quinces known in Ontario, the former as a stock for budding dwarf pears, and the latter as a standard market variety. The Orange quince succeeds admirably in the Niagara peninsula, ripening well, taking on a beautiful rich golden color, and reaching a fine, large size, either on clay or sandy loam. In old days this variety brought $6 or $7 per barrel in Toronto market, but the prices are now much lower.



ORANGE.

ORIGIN: Southern Europe.

TREE: a slow grower, bushy, seldom attaining a height of more than twelve or fifteen feet; hardy, will endure neglect but responds well to good cultivation and manure; delights in moist land, without standing water; fairly productive.

FRUIT: large and weighing from eight ounces to a pound; form somewhat like an apple, but with protuberance about the stem instead of a depression; skin golden yellow at maturity, with often a little greenish or russet color about the stem, which is set in a narrow cavity; calyx large segment, which are leaf like, in a large, deep, corrugated basin.

FLESH: tender in texture and good in flavor.

VALUE: limited demand in Canadian markets.

SEASON: late September to early October.

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2. The Grape.

There is no more popular fruit than the grape, and, owing to the rapid increase in population during recent years, the demand for grapes is constantly growing. For this reason, the planting of grapes, which was, in a large measure, suspended for a few years, is steadily increasing, many vineyards now being established annually.

The grape requires a comparatively dry hot season for the development of good flavor and the perfect ripening of the fruit, and as most of the cultivated varieties will not stand very low temperatures, unless protected, the grape succeeds best in the most southern parts of the Province, the commercial vineyards being confined almost entirely to the Niagara Peninsula, and to the district bordering Lake Erie. The grape can, however, be grown successfully over a much wider area than this, and where the summer temperature is fairly high and spring and early autumn frosts are rare, large quantities of grapes are grown for home consumption. Hence the early varieties of this fruit may be ripened pretty generally over the Province as far north as latitude 45 degrees and probably further.

A southern or south-eastern slope, if it can be procured, is preferable for the grape, as this fruit will ripen quicker with this exposure, but the site is not so important in the best grape districts as it is further north. A site should, however, be chosen which will not be subject to local frosts. In the north, a sandy loam is much to be preferred, as, if well drained, it will be the warmest, and all the heat that can be obtained is needed. In the warmer portions of the Province, grapes succeed admirably on the clay loams, and, if well drained, these are considered the best. The soil should be thoroughly prepared as for other fruits. The best vines for planting are two years old, but some strong growing varieties make good plants in one year. Strong growing varieties require more space in a vineyard than those less vigorous, but an average distance of ten feet apart each way is perhaps the most satisfactory. The plants should be set in a little deeper than they were in the nursery. With grapes, it is better to err on the side of deep than shallow planting. The young vine should be cut back to within one or two buds when set. To encourage strong growth, cultivation should be thorough in the vineyard until the vine begins to bear well. At the close of the first season and before the growth begins the following spring, the vine should be again pruned back to one or two strong buds. During the second season, only two canes are permitted to grow, in order that these may become as strong as possible. Before growth begins in the third year, it will be necessary to put down the trellis. If the Kniffen system is adopted, two wires will be sufficient, but if other methods are followed, three are usually necessary. The Kniffen system of training is more general in the grape districts than any other, mainly for the reason that by this method the least labor is involved. If two canes were left during the second season's growth, the weaker is removed, the other is tied upright to the two wires, the lower one being about 3 feet 6 inches from the ground, and the upper about 2 feet higher. Shoots will be thrown out along this main trunk, all of which are allowed to grow throughout the season.

Before growth begins in the spring of the fourth season, all the canes are cut away except four. Two of these are extended, one on each side of the main trunk along the upper wire and tied to it, and two on each side of the main trunk along the lower wire, at the same time heading back the upper canes to eight or nine buds and the lower to six or seven. No summer pruning is usually practised with this system, the growing shoots falling over the wires and attaching themselves there, often making very rampant growth, so much so that the tips are sometimes lopped off with a pruning hook.

The vine should bear a full crop this season, which is the fourth from planting. Before growth starts in the fifth season, all canes are again removed, except four, and as these could not very well be obtained in line with the wires, if taken from the main trunk, the canes are utilized which spring from the base of the canes which were left the year before. This same system is adopted year after year. In time, such a large stub develops at the point where the new canes are taken each year that it becomes

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necessary to remove these and take new canes from the main trunk. A good supply of new wood is required each year in grape growing, as fruit is produced only near the base of the previous season's growth. About forty strong buds or even less are sufficient to give a profitable crop of most varieties.

For the north, quite a different system is necessary, as the vines have to be covered with the soil in the winter to protect them. On this account, the arms have to be trained low, so that they may be covered easily. The best system which has been found where such conditions prevail in Ontario is a modification of the "High Renewal." By the "High Renewal" system, new wood is obtained from near the ground every year and several canes trained in a somewhat fan shape. This system is adopted in some parts of New York State, where vines do not have to be covered. By a modification of this system, two arms are left for two or three years. Three wires are required, the lowest being about eighteen inches from the ground, and the others about two feet apart. The two canes which have been made during the second season's growth, as previously described, are both saved. They should start from the main stem as near the ground as possible, and are tied to the wire in opposite directions. The shoots which are made the third season are tied upright to the wires and spread as evenly as possible. Lateral shoots should be removed. Before winter, all the canes that season should be headed back to within one or two buds of the two main arms, and just before winter sets in, they should be bent down and covered with a few inches of soil. In fact, the vine should be covered each winter from the time it is set. Vines should be kept covered in the north as long as possible to prevent injury from spring frosts. At Ottawa, the vines are not uncovered until the end of the first week or beginning of the second week in May.

In the fourth season after planting, the shoots are again trained upright and tied to the wires. Laterals are removed and any other shoots which make the vine so crowded that the fruit will not obtain plenty of light and sunshine. The mistake is often made of leaving too many shoots to grow, thus preventing the perfect ripening of the fruit. Forty strong shoots are quite sufficient to produce a good crop of fruit, although some varieties will stand a few more.

As arms get older, they become more difficult to lay down, hence it is found advisable to remove the arms every two or three years, and replace them with new ones. The arms may be renewed in alternate years, and this is often desirable, as the buds on one arm are sometimes destroyed by winter, or by spring, frosts The only important difference between this system and the horizontal arm is that in this the arms are not permanent. It resembles the "High Renewal" from the fact that new wood is obtained frequently from the main stem near the ground.

Grapes require considerable potash, hence fertilizers containing a high percentage of this should be used rather than nitrogenous manures. Cover crops will usually supply all the nitrogen that is required.

Grapes should not be picked until they are quite ripe, as they do not ripen after they leave the vine. It is believed that the consumption of grapes would be much greater in the cities and towns if fruit growers would not pick and ship the fruit when it is green.

VARIETIES RECOMMENDED.

GENERAL LIST, APPROVED BY THE BOARD OF CONTROL.

Black: Moore, Campbell, Worden, Concord, Wilder.
Red: Delaware, Lindley, Agawam, Vergennes.
White: Diamond, Niagara.

FOR NORTHERN SECTIONS:

Black: Champion, Moore, Campbell, Worden.
Red: Moyer, Brighton, Delaware, Lindley.
White: Winchell, Diamond.

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DISTRICT LISTS.

NIAGARA DISTRICT.

(Including the Niagara Peninsula from the Niagara River to Hamilton and north to the escarpment.)

EGBERT M. SMITH, Winona.

Black: Champion, Worden, Wilder, Concord.
Red: Delaware, Lindley, Agawam, Vergennes.
White: Diamond, Niagara.

FONTHILL DISTRICT.

(Including Townships of Pelham, Stamford, and Thorold.)

G. C. BROWN, Fonthill.

Moore, Worden, Niagara, Delaware, Concord, Lindley.

BURLINGTON-OAKVILLE DISTRICT.

(Including the southern part of the counties bordering on Lake Ontario between Hamilton and Toronto.)

A. W. PEART, Burlington.

Black: Moore, Worden, Concord.
Red: Moyer, Delaware, Lindley, Massasoit.
White: Diamond, Niagara.

W. G. HORNE, Clarkson.

Moore, Worden, Concord, Delaware.

ESSEX PENINSULA.

(Including Essex, Kent and Pelee Island.)

J. L. HILBORN, Leamington.

Black: Champion, Moore, Concord.
Red: Brighton, Vergennes, Catawba.
White: Diamond, Niagara.

LAKE HURON DISTRICT.

(Including Counties of Huron and Bruce.)

D. F. HAMLINK, Goderich.

Champion, Moore, Worden, Niagara, Concord.

GEORGIAN BAY DISTRICT.

(Including northern portions of the Counties of Grey and Simcoe, bordering on the Georgian Bay.)

J. G. MITCHELL, Clarksburg.

Black: Champion, Campbell, Worden.
Red: Delaware, Brighton, Vergennes, Salem.
White: Winchell, Diamond, Niagara.

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LAKE SIMCOE DISTRICT.

(Including the northern and eastern section of Simcoe and northern sections of York and Ontario bordering on Lake Simcoe.)

G. C. CASTON, Craighurst.

Campbell, Moyer, Moore, Diamond, Winchell.

GUELPH DISTRICT.

(Including the high inland counties of south-western Ontario. *i.e.*, Wellington, Waterloo, north-western section of Perth, south part of Grey, Dufferin, and north-west section of Peel and Halton.)

PROF. J. W. CROW, O.A.C., Guelph.

Black: Moore.
Red: Moyer.
White: Winchell.

LAKE ONTARIO DISTRICT.

(Including the southern portions of the Counties bordering on the Lake Ontario shore from Toronto to Trenton.)

A. B. ARNOTT, Trenton.

Black: Moore, Worden, Concord.
Red: Brighton, Lindley, Agawam, Massasoit.
White: Niagara, Pocklington.

OTTAWA DISTRICT.

(Including the Ottawa Valley and the eastern portion of the Province, not elsewhere enumerated, south of latitude 46 deg.)

W. T. MACOUN, Horticulturist, Central Experimental Farm, Ottawa.

Black: Early Daisy, Mamito, Worden, Merrimac, Wilder.
Red: Moyer, Brighton, Delaware, Lindley.
White: Winchell, Diamond.

ALGOMA DISTRICT.

(Including the Islands of Manitoulin and St. Joseph, and a limited portion of the northern and eastern shore of the Georgian Bay.)

CHAS. YOUNG, Richard's Landing.

Campbell, Moore, Winchell, Janesville.

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DESCRIPTION OF VARIETIES.

AGAWAM. (*Rogers' 15.*)

One of the leading varieties for profit, but in some sections subject to mildew and rot.

ORIGIN: by E. S. Rogers, Salem, Mass.
VINE: a strong grower; very productive; self fertile; wood, long jointed, stout, should have long pruning.
BUNCH: large, compact, shouldered.
BERRY: large; skin, thick; color, brownish red.
FLESH: tender; flavor, sweet, sprightly, very good.
QUALITY: dessert, very good.
VALUE: market, first class.
SEASON: soon after that of Concord.

ALICE.

A good grape, but a little late to be very popular for market purposes.
ORIGIN: New York State.
VINE: very vigorous; productive.
BUNCH: roundish; shouldered; compact.
BERRY: size, small to medium; round; color, dark wine, with light bloom.
FLESH: tender pulp, juicy; color, light green; flavor, vinous, aromatic, pleasant.
QUALITY: dessert, good.
VALUE: second class for market.
SEASON: early October.

BACCHUS.

A good wine grape.
ORIGIN: seedling of Clinton, raised by J. H. Ricketts, Newburgh, N.Y.
VINE: vigorous; free from mildew; productive.
BUNCH: size, medium; compact; shouldered.
BERRY: size, small; round; black, with blue bloom.
FLESH: texture, juicy; flavor, sprightly, superior to Clinton.
QUALITY: dessert, fair.
VALUE: second rate for market.
SEASON: late; cannot be depended upon to ripen north of lake Ontario.

BARRY. (*Rogers' 43.*)

An excellent exhibition grape; one of the most attractive of Rogers' hybrids; but not equal to Wilder for the commercial vineyard.

ORIGIN: a hybrid from Black Hamburgh and Mammoth Sage, raised by E. S. Rogers, of Salem, Massachusetts.
VINE: vigorous; healthy; productive; self sterile and needs mixed planting; sometimes drops its leaves before maturity of the fruit.
BUNCH: medium; form, short, compact, rather broad.
BERRY: large; roundish; color, black, with blue bloom.
FLESH: tender; flavor, sweet, pleasant.
QUALITY: dessert, good.
VALUE: market, first class; a good shipper.
SEASON: mid September to October.

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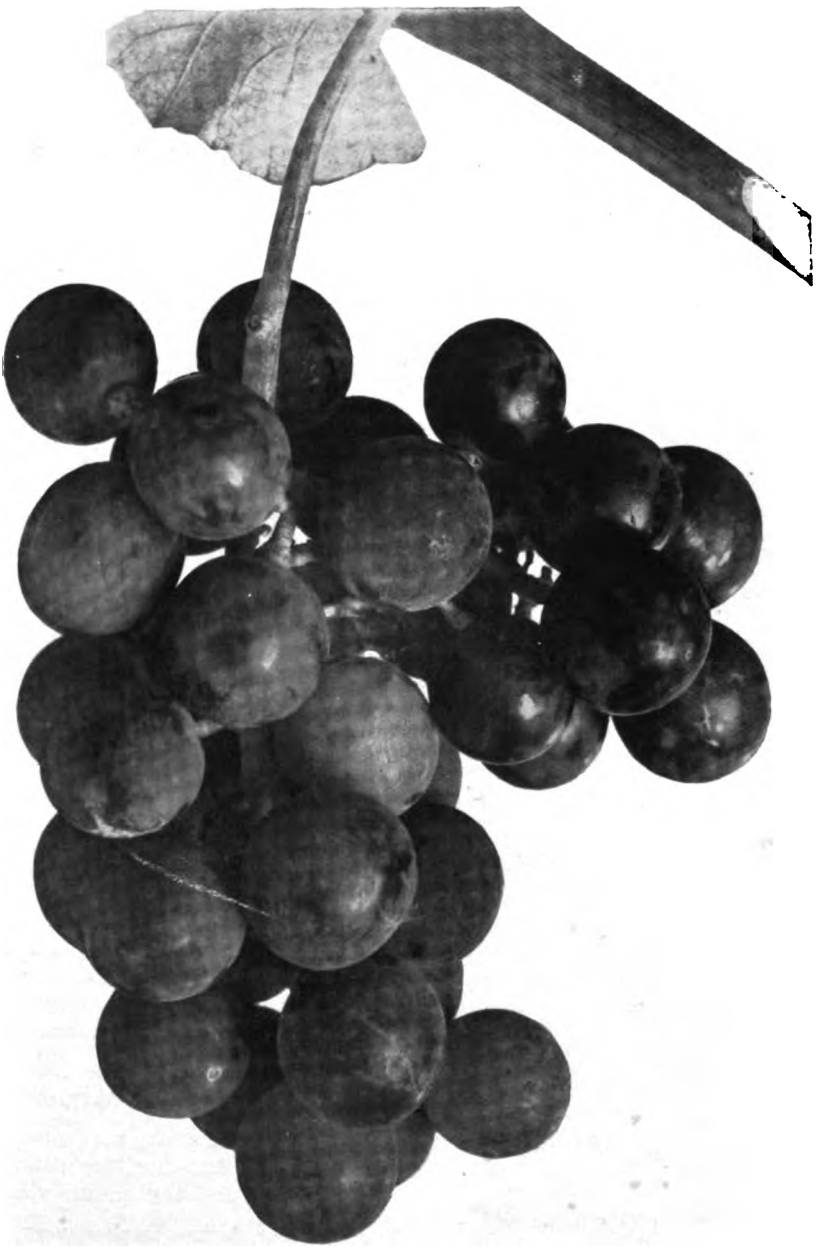

AGAWAM.

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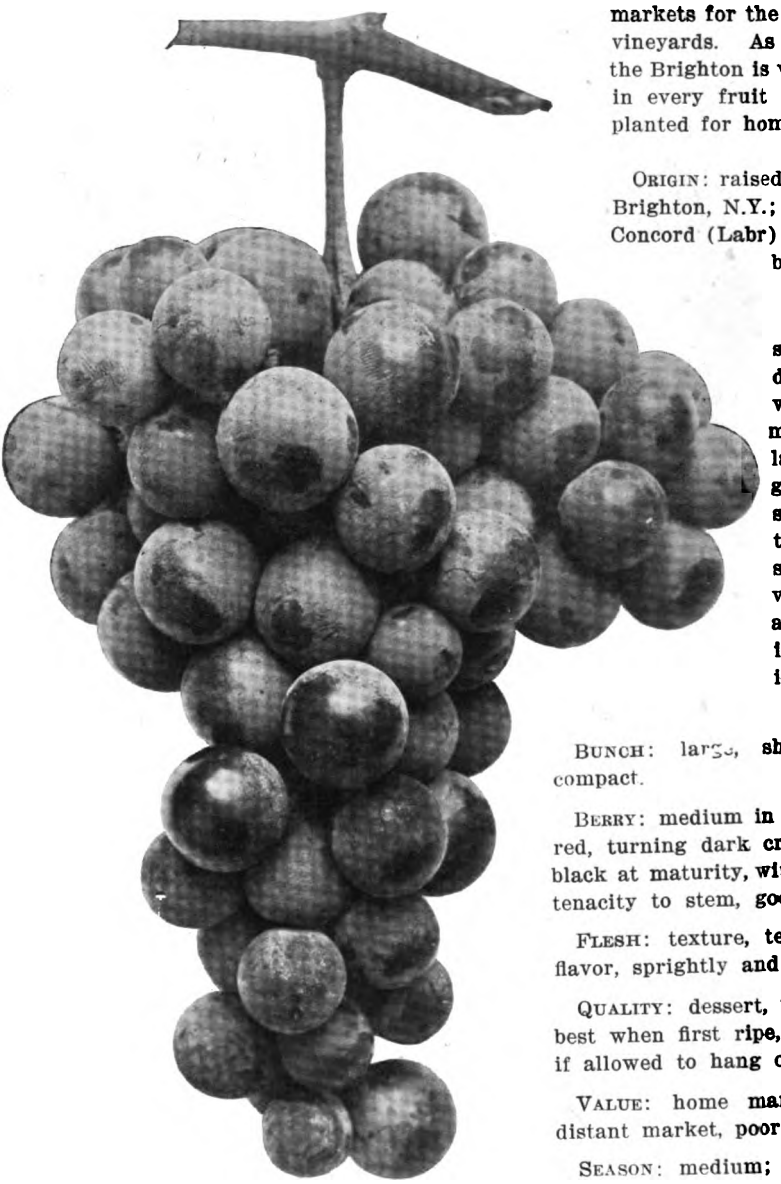
BRIGHTON.

The fine size of its bunches and the excellence of its flavor as a dessert grape gave promise, in its first introduction, that the Brighton would be a popular commercial grape in Ontario; but in this we have been disappointed, because of its susceptibility to mildew, and its poor shipping quality. The latter point is of importance to our Ontario fruit growers, who look forward to the great North-west as one of the best markets for the product of their vineyards. As a dessert grape, the Brighton is worthy of a place in every fruit garden which is planted for home uses.



BRIGHTON.

ORIGIN: raised by Jacob Moore, Brighton, N.Y.; a cross between Concord (Labr) and Diana Hamburg (Vinifera).

VINE: vigorous; semi-hardy; productive; somewhat subject to mildew; leaves, large, thick, dark green; pollen, sometimes defective, and the vine should have other varieties which are good pollenizers planted near it.

BUNCH: large, shouldered, fairly compact.

BERRY: medium in size; color, light red, turning dark crimson or almost black at maturity, with purple bloom; tenacity to stem, good; skin, tender.

FLESH: texture, tender and juicy; flavor, sprightly and very pleasant.

QUALITY: dessert, very good, at its best when first ripe, but deteriorates if allowed to hang on the vine.

VALUE: home market, very good; distant market, poor.

SEASON: medium; not a long keeper.

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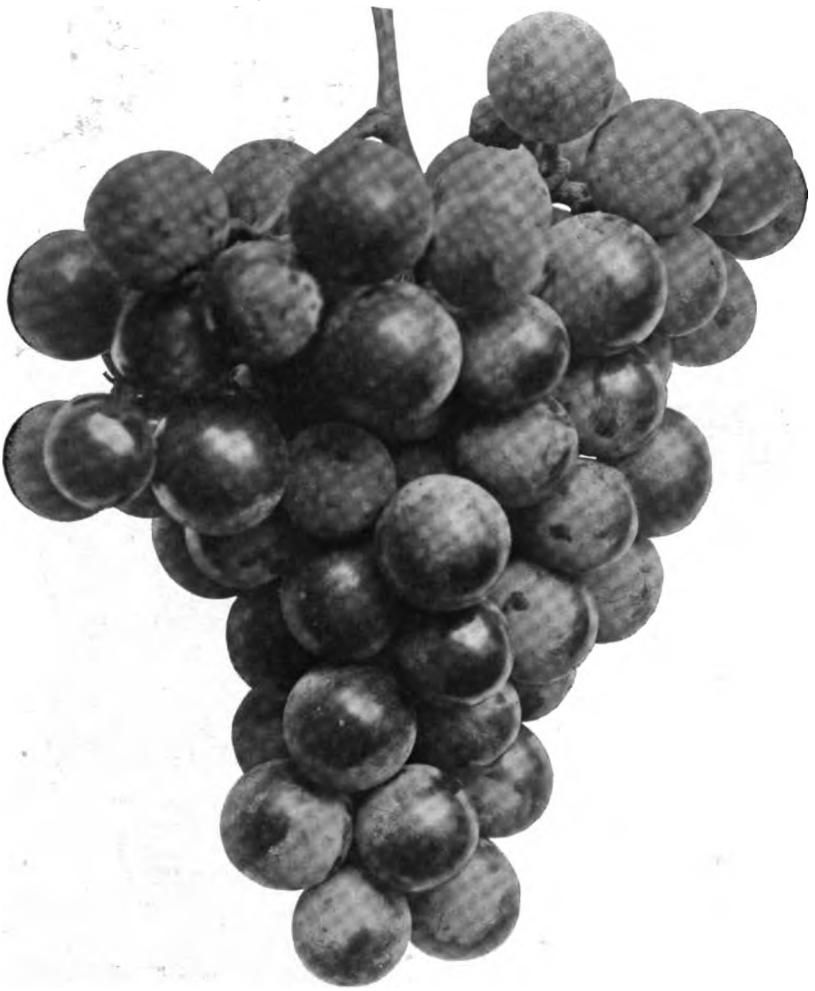
CATAWBA.

One of the best of wine grapes, and highly esteemed for dessert.

ORIGIN: a native of North Carolina, and takes its name from the Catawba river.

VINE: vigorous; productive; succeeds well in sandy loam; canes, long, with few laterals.

BUNCH: medium sized; moderately compact; shouldered.



CATAWBA.

BERRY: large; round; deep red, with lilac bloom; skin, moderately thick.

FLESH: texture pulpy, juicy; flavor, sweet, aromatic, musky.

QUALITY: dessert, very good; wine, best.

VALUE: market, first class, when well ripened.

SEASON: late; does not always attain full maturity, even in the southern parts of the Province.

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CAMPBELL.

(*Campbell's Early.*)

This grape is claimed to be an improved Concord, and is very promising as an early market variety.

ORIGIN: Ohio, by G. H. Campbell; the product of different crosses from Hartford, Concord, and Moore's Early, through Muscat Hamburgh. Introduced in 1896.

VINE: vigorous, healthy and productive.

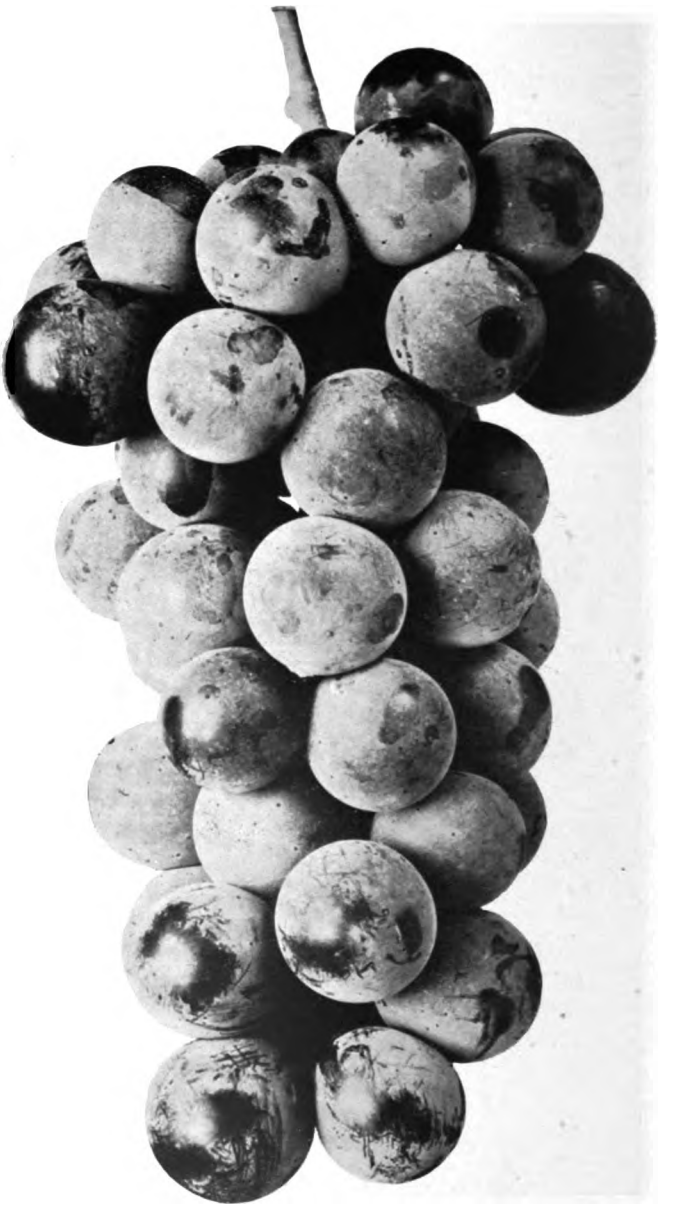
BUNCH: large shouldered.

BERRY: large; skin, black, with thin blue bloom, tough; flavor, rich and sweet, without foxiness; flesh, meaty, sweet, tender; seeds, small, separate easily from the pulp; hangs well to vine.

QUALITY: fine for dessert.

VALUE: first class for market.

SEASON: about the same as that of Moore.



CAMPBELL.

PERKINS.

An early market grape, healthy in vine and fruit, and a sure cropper.
ORIGIN: Massachusetts.
VINE: vigorous; hardy; productive and free from disease.
BUNCH: size, medium; shouldered; compact.
BERRY: size, medium; form, roundish oblong; color, amber, with whitish bloom.
FLESH: texture, pulpy, juicy, not melting; flavor, sweet.
QUALITY: dessert, poor; wine, good.
VALUE: market, second class; a poor keeper.
SEASON: early.

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CHAMPION.

Widely planted for market because of its early coloring and apparent early ripening, but so sour and so poor in quality, as usually sold on the market, that it has seriously lessened the demand for Concord grapes, which follow it in season.

ORIGIN: New York State, about 1873; first sold as Talman's Seedling.

VINE: vigorous; healthy, not subject to mildew; very productive.

BUNCH: size, medium; shouldered.

BERRY: size, medium; form, round; color, bluish black; pulpy; acid until very ripe; skin, thick.

CHAMPION.

QUALITY: dessert, very poor.

VALUE: market, fair, sells well on its outside appearance before better flavored kinds are on the market.

SEASON: a week or ten days earlier than the Concord, but often well colored two weeks earlier.

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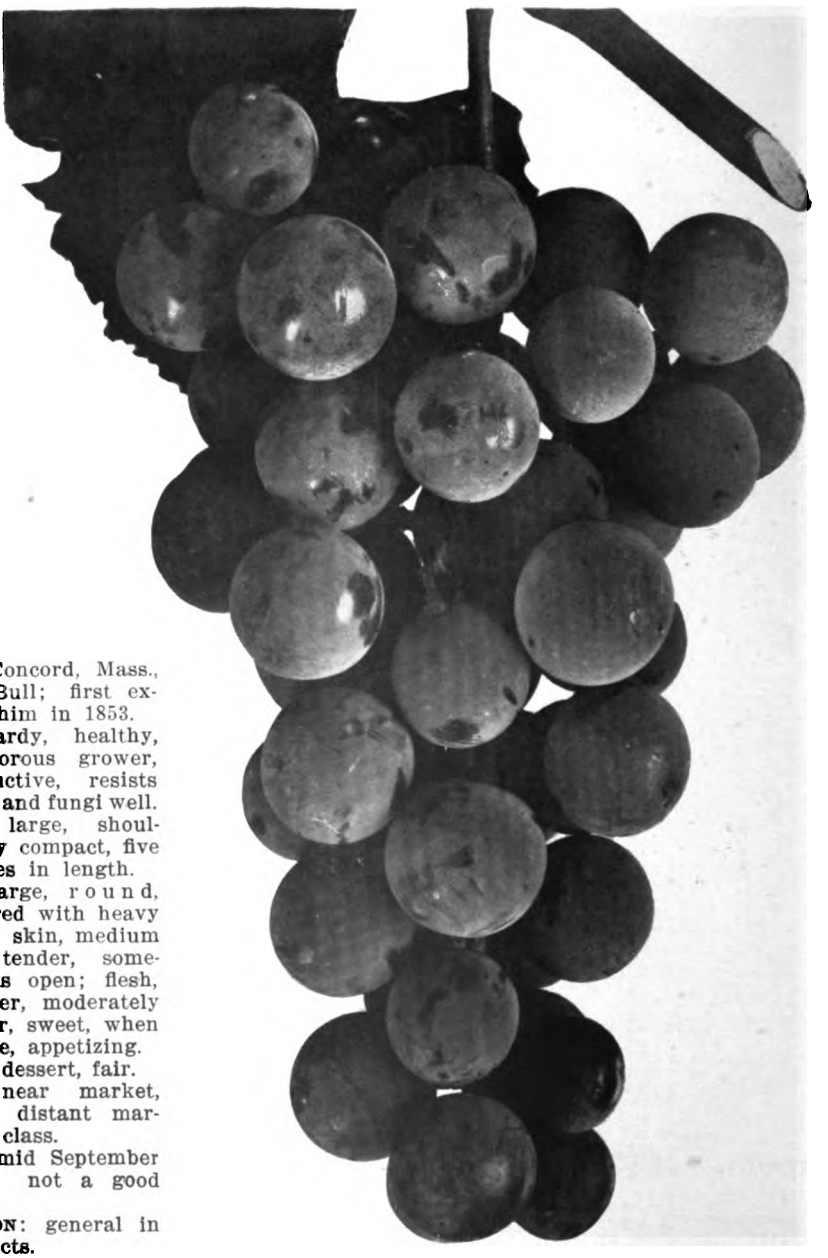
CONCORD.

The principal out-door grape grown for market in the Province of Ontario. Probably more than half the vines in the large commercial vineyards of the Niagara district, as well as in Essex and other parts of southern Ontario are of this variety.

The reason of this is (1) its comparative freedom from mildew, (2) its vigor of vine, (3) its productiveness. Four tons to the acre is not an uncommon yield, so that, even when it sells as low as 1½ cents per pound, there is yet a fair return for the investment.



CONCORD.

ORIGIN: Concord, Mass., by E. W. Bull; first exhibited by him in 1853.

VINE: hardy, healthy, strong, vigorous grower, very productive, resists both insects and fungi well.

BUNCH: large, shouldered, fairly compact, five to six inches in length.

BERRY: large, round, black, covered with heavy blue bloom; skin, medium thickness, tender, sometimes cracks open; flesh, pulpy, tender, moderately juicy; flavor, sweet, when fully mature, appetizing.

QUALITY: dessert, fair.

VALUE: near market, first class; distant market, second class.

SEASON: mid September to October; not a good keeper.

ADAPTATION: general in grape districts.

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DELAWARE.

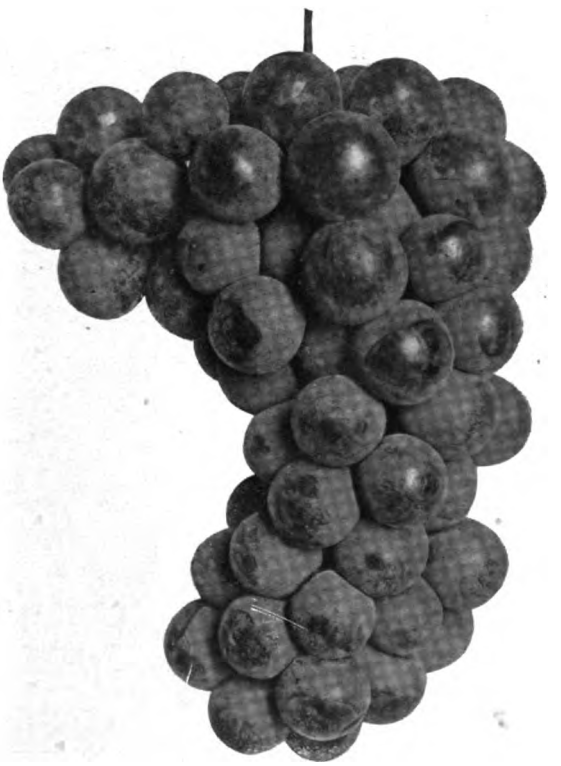
Universally acknowledged to stand at the head of all American grapes in point of quality. For the home garden, a few vines of this variety are indispensable, for it is the most excellent of dessert varieties. It is also one of the highest priced grapes in our markets, often bringing more than double the price of the Concord. It is, however, not very much grown in our commercial vineyards, because the foliage is badly subject to thrip, and the yield is only moderate. On rich, deep soils, well drained, however, with high cultivation, thinning and close pruning, it is productive and profitable. It should be planted much closer than the Concord. Vines of the latter variety are usually planted ten feet apart, while the Delaware may be set five or six feet apart.

ORIGIN: unknown. Name from Delaware, Ohio, where in 1855 it was first brought into notice, though not disseminated until ten years later. It was first found in a garden in Frenchtown, N.J. The Bushberg Catalogue thinks it a natural cross between Labrusca and Vinifera, a native American and a European variety.

VINE: moderate grower; foliage, delicate, subject to thrip; wood, slender, hardy; a regular, sometimes an abundant, bearer.

BUNCH: small, compact, usually shouldered.

BERRY: small; round; skin, thin; color, a beautiful light red, with whitish bloom, translucent; pulp, sweet, sprightly, aromatic; juice, abundant, sweet, vinous.



DELAWARE.

QUALITY: dessert, good.

VALUE: market, first class.

SEASON: September.

ADAPTATION: general throughout the grape sections.

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DIAMOND. (*Moore's Diamond.*)

A grape that is growing in popularity, and which succeeds in sections farther north than the Niagara.

ORIGIN: Brighton, N.Y., in 1873, by Mr. Jacob Moore, from seed of Concord, fertilized with Iona; just one year after the Niagara was originated at Lockport.

VINE: vigorous and productive, though not equalling the Niagara; foliage much like that of one of its parents, the Concord.

DIAMOND.

BUNCH: large. compact and shouldered.

BERRY: adheres firmly to the stem; color, greenish white, yellowing slightly at maturity; pulp, tender; flavor, juicy, sweet and good.

QUALITY: dessert, very good.

SEASON: about one week in advance of the Concord.

ADAPTATION: worthy of trial generally.

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EARLY OHIO.

An early market grape.
ORIGIN: a chance seedling raised by R. A. Hunt, Euclid, Ohio.
VINE: healthy; vigorous; productive.
BUNCH: large, compact, often shouldered.
BERRY: medium size; color, black, with heavy bloom; tenacious of stem; flavor, spicy, pleasant.
SEASON: a few days in advance of Moore.
ADAPTATION: not proven.

EARLY VICTOR.

The Early Victor grape colors very early, fully two weeks ahead of Concord, and is fit to gather about ten days before, along with Hartford and Moore Early.
ORIGIN: by John Burr, of Leavenworth, Kansas, in 1870. A seedling of the Delaware.
VINE: very vigorous, very productive and healthy.
BUNCH: shouldered and very compact.
BERRY: medium, round, black, with thick blue bloom, adheres well; pulp, tender, juicy, sweet, and agreeable; seeds, two.
QUALITY: very good for dessert, also very good for making claret wine.
VALUE: first class for home market.
SEASON: early.

EMPIRE. (*Empire State.*)

A beautiful white grape, with well formed bunches, which was introduced with great eclat, but has not become very popular in the commercial vineyards of Ontario.
ORIGIN: from seed of Hartford, fertilized with Clinton, raised by James H. Ricketts.
VINE: vigorous, healthy, and moderately productive.
BUNCH: size, large; shouldered; compact.
BERRY: medium; color, white, with thick bloom; pulp, tender, juicy, sweet, and agreeable.
QUALITY: dessert, very good.
VALUE: market, first class.

GAERTNER. (*Rogers' 14.*)

An excellent grape which is gaining in favor.
ORIGIN: hybrid between White Chasselas and a wild Labrusca.
VINE: healthy; fairly vigorous and productive.
BUNCH: medium in size; shouldered.
BERRY: size, large; round; color, light reddish brown; skin, thin.
FLESH: texture moderately tender; flavor, sweet, rich, aromatic.
QUALITY: dessert, very good.
SEASON: about with Concord.

HARTFORD. (*Hartford Prolific.*)

An old variety ripening in advance of Concord, but not popular as a market grape, because it drops its fruit so soon after maturity.
ORIGIN: raised at Hartford, Connecticut, from seed of Isabella, about 1850.
VINE: hardy; vigorous; very productive.
BUNCH: large; shouldered; rather compact.
BERRY: size, medium; round; color, black, with thin blue bloom; skin, thick.
FLESH: whitish; texture, pulpy, juicy; flavor, foxy.
QUALITY: dessert, poor.
VALUE: market, second class, because of the fruit dropping from the stems; soon shrivels.
SEASON: a week before Concord.

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JANESVILLE.

Valuable only in the colder sections.
ORIGIN: Hartford x Clinton.
VINE: hardy; vigorous; productive.
BUNCH: medium; short; compact; shouldered.
BERRY: size, medium; black; skin, thick; slight blue bloom.
FLESH: pulpy; color, greenish; flavor, vinous.
QUALITY: dessert, poor.
VALUE: market, second class.
SEASON: early.

JESSICA.

An excellent dessert grape for the amateur's garden.
ORIGIN: Canada; a seedling raised by W. H. Read, of Port Dalhousie, introduced by Mr. D. W. Beadle, of St. Catharines, and first described in the *Canadian Horticulturist* for February, 1884.
VINE: fairly vigorous, hardy and healthy.
BUNCH: shouldered, compact.
BERRY: medium; color, yellowish green to white; skin, thin; pulp, tender, juicy; flavor, sprightly, aromatic, sweet and very agreeable, free from foxiness.
QUALITY: very good for dessert.
VALUE: market, too small; home uses very good.
SEASON: early.
ADAPTATION: general.

LADY.

A fine early sweet grape for the home garden; not desirable for the commercial vineyard.
ORIGIN: a pure Concord seedling, introduced by G. W. Campbell, of Ohio, in 1874.
VINE: fairly vigorous; slender; healthy; fairly productive.
BUNCH: medium in size; oblong; slightly shouldered.
BERRY: medium to large; round; greenish yellow, with white thin bloom.
FLESH: pulp, tender, juicy; flavor, vinous, sweet, slightly aromatic.
QUALITY: dessert, good.
VALUE: market, second class.
SEASON: early to medium.

LINDLEY. (*Rogers' 9.*)

A favorite red grape for both domestic and commercial purposes. Of late, however, the vine has been somewhat disappointing in productiveness.
ORIGIN: Massachusetts, by E. S. Rogers; hybrid, between Wild Mammoth grape of United States and Golden Chasselas.
VINE: vigorous; healthy, fairly productive.
BUNCH: medium in size; rather long; shouldered; loose.
BERRY: medium to large; color, almost brick red.
FLESH: tender, separating freely from seeds; flavor, sweet, rich, aromatic.
QUALITY: very good for domestic or commercial purposes.
VALUE: market, first class.
SEASON: a few days in advance of Concord. Keeps easily until January.

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LINDLEY.

TRANSPARENT.

Valuable in Ontario only as a wine grape.
ORIGIN: seedling of Taylor, by Jacob Rommell, of Missouri.
VINE: vigorous, productive, free from mildew and rot.
BUNCH: compact, shouldered.
BERRY: firm, round; color, pale greenish yellow, transparent, with thin grey bloom; skin, thin; pulp, tender, juicy; flavor, fine and sweet.
SEASON: medium.
ADAPTATION: southern sections of the Province.

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MASSASOIT. (*Rogers' 3.*)

Commended for the home garden as a fine red table grape. Needs careful spraying with Bordeaux to prevent black rot.

ORIGIN: seedling raised by E. S. Rogers, Salem, Mass.

VINE: vigorous; susceptible to attacks of black rot; self sterile.

BUNCH: medium size; shouldered; loose, fruit does not always set.

MASSASOIT.

BERRY: size, medium; form, round; color, brownish red.

FLESH: texture, tender, juicy; flavor, sweet, vinous.

QUALITY: dessert, very good.

VALUE: not profitable for market.

SEASON: just in advance of Concord.

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MERRIMAC. (*Rogers' 19.*)

Considered by some the finest and most reliable black Rogers grape; in Ontario, the Wilder is considered more profitable, having larger bunches.

ORIGIN: Mammoth Sage x Black Hamburg; raised by Mr. E. S. Rogers, of Salem, Massachusetts.

VINE: vigorous; healthy; self sterile and needs mixed planting.

BUNCH: medium in size; fairly compact; roundish.

BERRY: size, large; color, black, with blue bloom.

FLESH: color, greenish; texture, half tender, juicy; flavor, sweet, vinous.

QUALITY: dessert, very good.

VALUE: market, first class.

SEASON: early to medium.

MOYER.

For the amateur's garden, this is a grape that should not be overlooked, for, as a dessert grape, it has now been fairly well tested, and seems to be growing in favor.

ORIGIN: Port Dalhousie, Ontario, by W. N. Read, from Delaware, fertilized with Miller's Burgundy, about 1880.

VINE. fairly vigorous, healthy and not subject to mildew, hardy; not very productive.

BUNCH: small, cylindrical in form, shouldered, not very compact, not uniform in size.

BERRY: small, round; color, amber, with grayish bloom; skin, thin, tough; pulp, tender, juicy; flavor, rich, sweet and excellent.

QUALITY: dessert, very good, but inferior to Delaware.

VALUE: second class for market.

SEASON: early.

MOYER.

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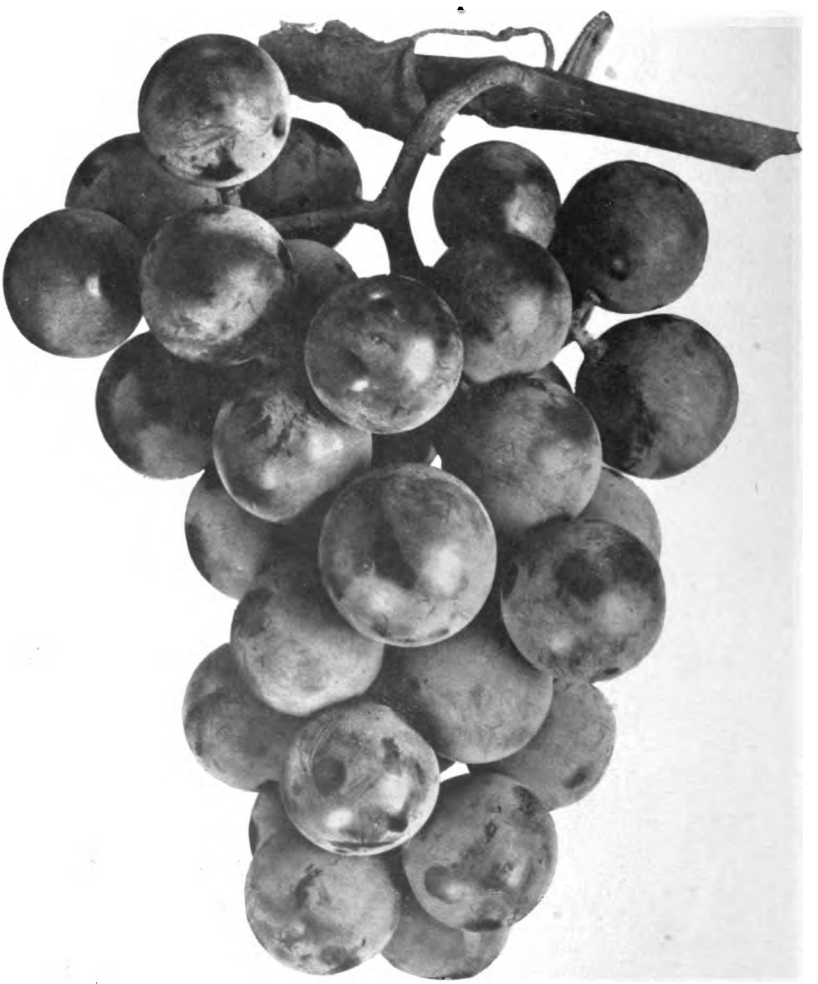
MOORE. (*Moore's Early.*)

A favorite with vineyardists in Ontario, because of its earliness and its good quality. As early as Champion and of very much better quality, it is superseding that variety which has done so much to prejudice buyers against our black grapes.

ORIGIN: by John B. Moore, at Concord, Mass., from Concord seed, in the year 1872.

VINE: hardy, healthy, fairly vigorous, but only moderately productive. if compared with the Concord; needs good cultivation.



MOORE'S EARLY.

BUNCH: smaller than Concord, and rarely shouldered.

BERRY: averaging a little larger than the Concord; round; black; thin bloom.

FLESH: vinous, juicy, with slight foxiness.

QUALITY: good.

VALUE: first class of its season.

SEASON: early.

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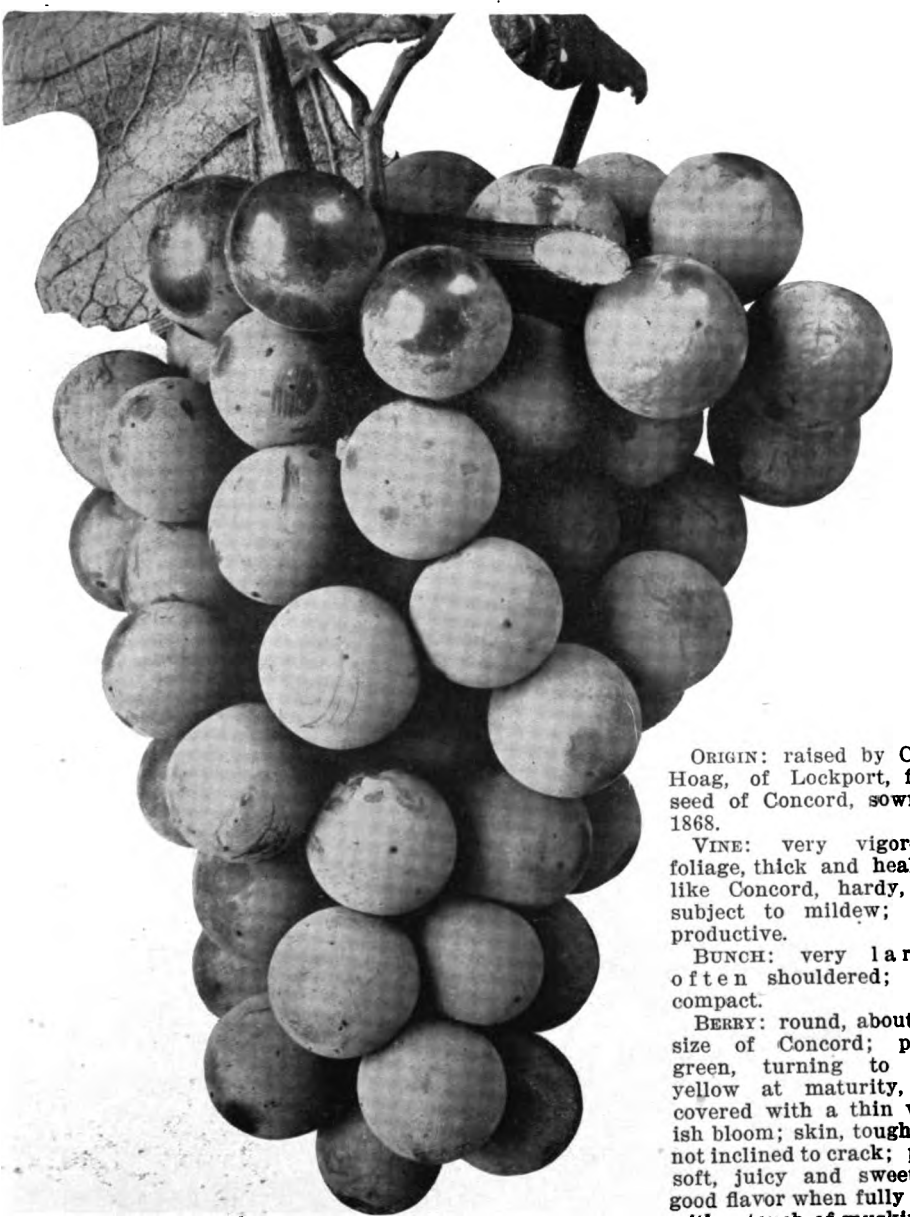
NIAGARA.

The Niagara is the leading white grape in Ontario for commercial purposes. In health, vigor of vine and in productiveness, it has no superior, and it has been planted more widely than any other variety, except the Concord. For dessert purposes, it is good in quality when well ripened. We do not rerommend it for sections north of Toronto, unless in favored locations.



NIAGARA.

ORIGIN: raised by C. L. Hoag, of Lockport, from seed of Concord, sown in 1868.

VINE: very vigorous; foliage, thick and healthy, like Concord, hardy, not subject to mildew; very productive.

BUNCH: very large; often shouldered; very compact.

BERRY: round, about the size of Concord; pale green, turning to pale yellow at maturity, and covered with a thin whitish bloom; skin, tough and not inclined to crack; pulp, soft, juicy and sweet, of good flavor when fully ripe, with a touch of muskiness.

QUALITY: dessert, good; canning, very good.
VALUE: home markets, first class.

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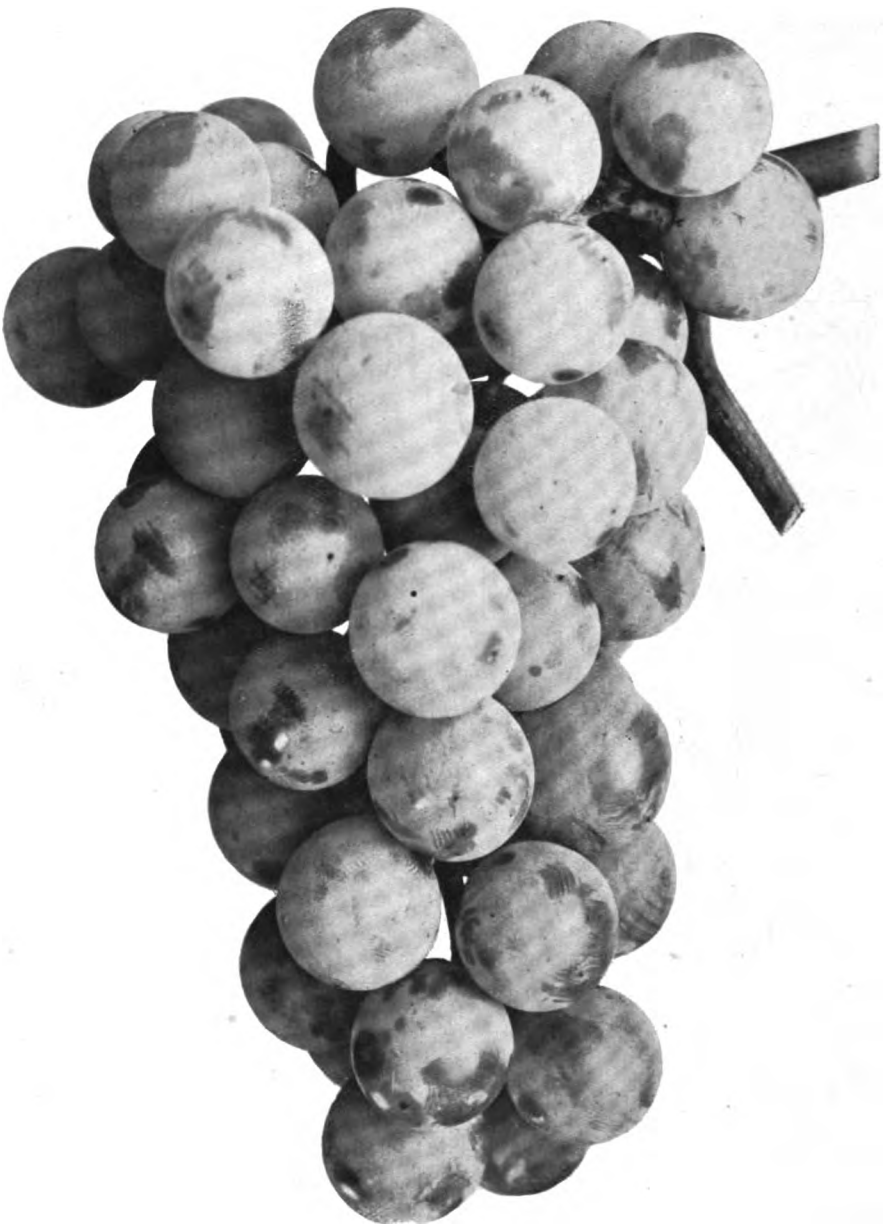
NORTHERN LIGHT.

A white grape, ripening late in September; not recommended for profit.
ORIGIN: Introduced by P. E. Bucke, Ottawa, Ontario.
VINE: vigorous; healthy; moderately productive.
BUNCH: compact; shouldered.
BERRY: size, medium; color, white; bloom, thin; flavor, sub-acid.
QUALITY: dessert, fair.
VALUE: market, hardly first class.
SEASON: late.



NORTHERN LIGHT.

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POCKLINGTON. (*Golden Pocklington.*)

This grape was first shown at the New York State Fair, Rochester, in 1877, and was at that time considered the largest and finest white grape of purely native origin, and was largely planted for commercial purposes. However, since the introduction of the famous Niagara, the Pocklington has been almost lost sight of, and is very little planted.

ORIGIN: a seedling of Concord, raised by John Pocklington, Sandy Hill, N.Y.

VINE: of medium vigor; moderately productive; healthy, resisting mildew and rot; of Labrusca (Concord) parentage.

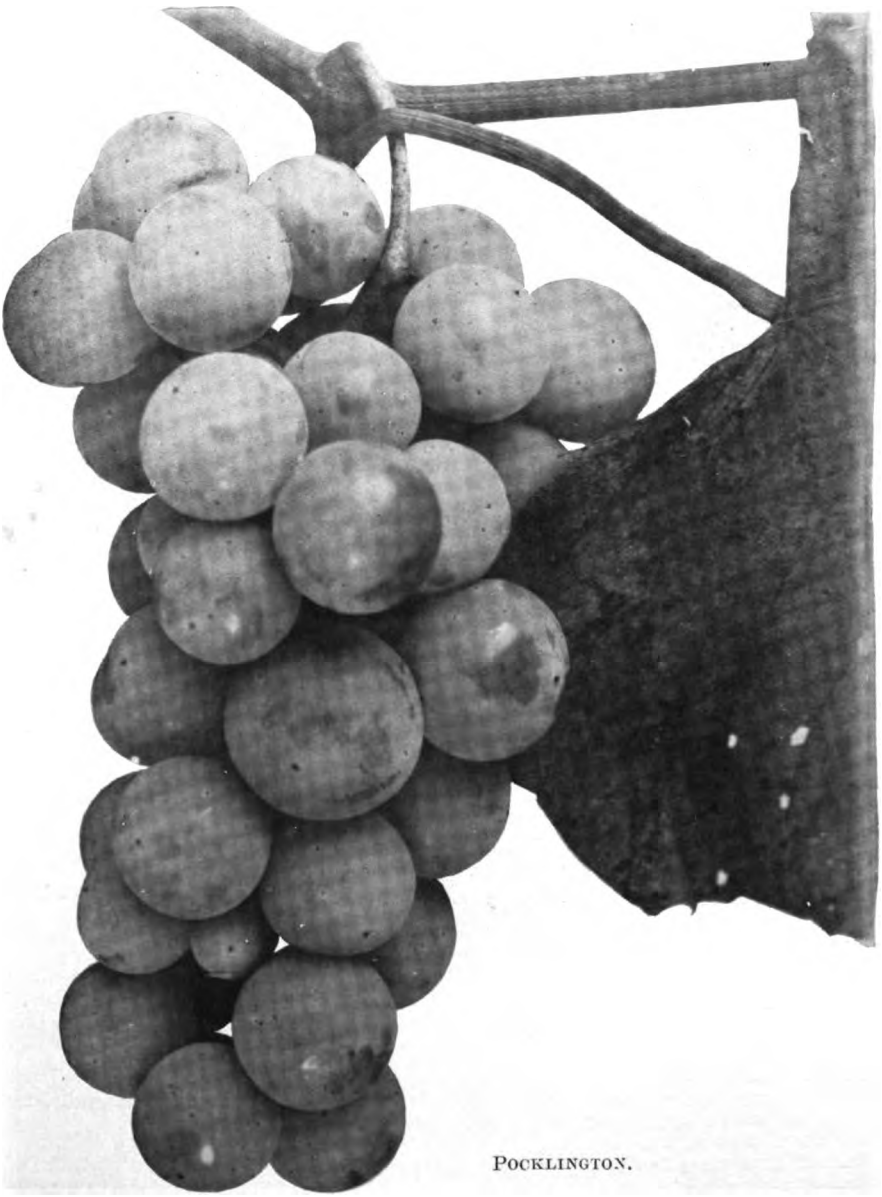
BUNCH: fairly compact, with small shoulder.

BERRY: round; color, pale green, turning golden yellow; flesh, pulpy, but tender and fairly juicy; flavor, sweet, somewhat foxy; drops from stem after gathering.

QUALITY: dessert, fair.

VALUE: home market, second class; distant market, third class.

SEASON: about a week later than Concord.



POCKLINGTON.

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REQUA. (*Rogers' 28.*)

A fine table grape, supposed to be too late for Canada, but ripening well in the Niagara district, a sample of the kind of grape which should be grown for export, but the vine is scarcely productive enough to be profitable.

ORIGIN: E. S. Rogers, Salem, Mass.; a hybrid between the Wild Labrusca, or Mammoth Fox grape, of Massachusetts, and a European variety. Mr. Rogers produced his seedlings in 1856, and at first introduced them by their numbers only.

REQUA.

VINE: fairly vigorous and moderately productive.

BUNCH: large, shouldered, moderately compact, but somewhat poor.

BERRY: large, round; skin, thin, wine color, with thick bluish bloom; pulp, tender, juicy; flavor, sweet, sprightly; seeds, two or three, of medium size.

QUALITY: dessert, very good.

VALUE: first class for home or foreign market.

SEASON: very late.

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SALEM.

One of the finest flavored of Rogers' hybrids; worthy of a place in the home garden.

ORIGIN: a hybrid between a native, the Wild Mammoth, fertilized by the Black Hamburg; raised by E. S. Rogers, Salem, Mass.

VINE: vigorous; productive; subject to black rot; foliage, large, strong.

BUNCH: medium size; compact; shouldered.

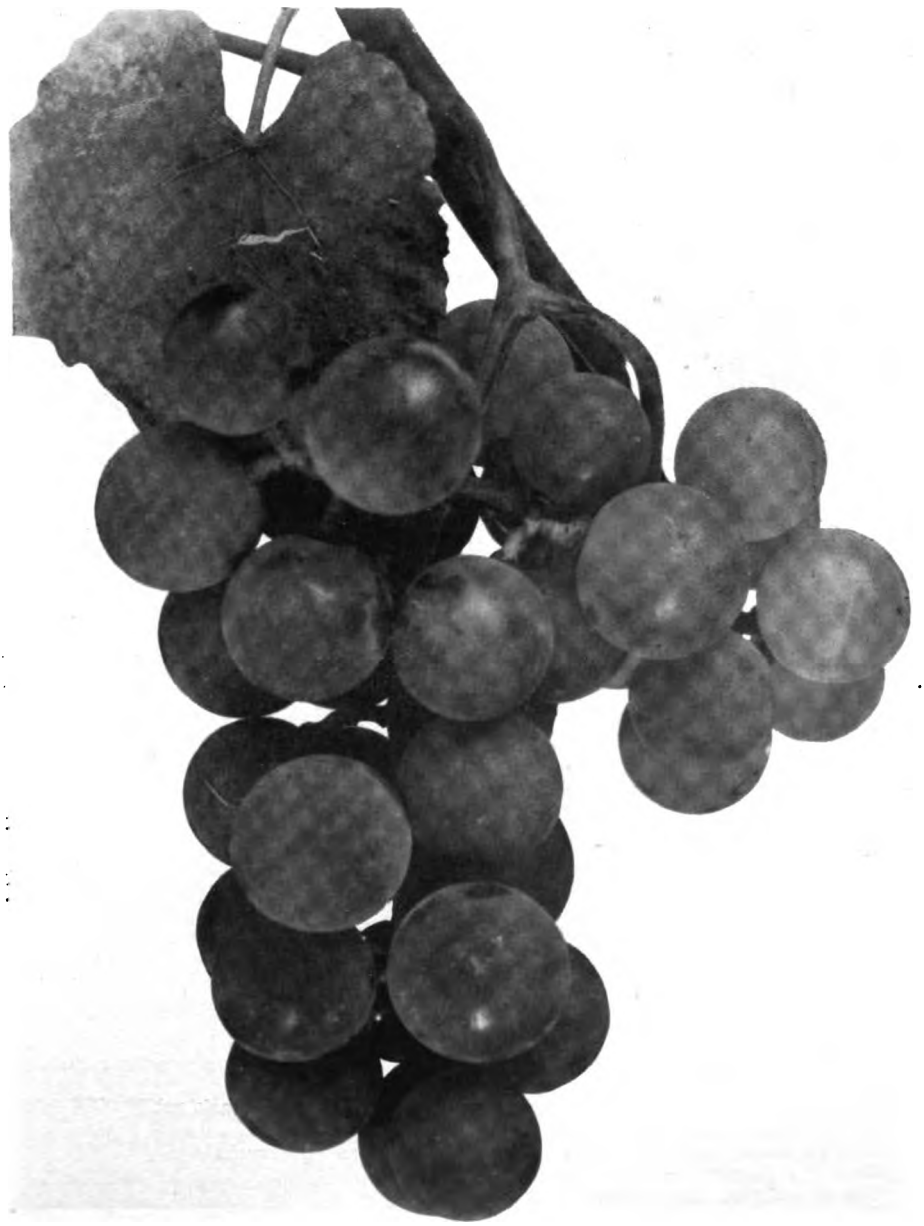
BERRY: size, large; form, round; color, chestnut red, with blue bloom; skin, thick; seeds, two, large.

FLESH: texture, fairly tender, free from hard pulp, juicy; flavor, sweet, vinous, sprightly, aromatic.

QUALITY: dessert, good.

VALUE: not profitable for Ontario fruit growers.

SEASON: about with the Delaware.



SALEM.

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VERGENNES.

VERGENNES.

The leading grape for winter use; may be kept in a cool cellar until spring.

ORIGIN: Vergennes, Vermont; introduced about 1880.

VINE: vigorous; healthy; productive.

BUNCH: medium; slightly shouldered; rather compact.

BERRY: large; oval; persistent; color, light amber to red, with greyish bloom.

FLESH: color, greenish; pulp, tender; fairly juicy; flavor, rich, pleasant, vinous.

QUALITY: dessert, fair; wine, good.

VALUE: market, second class in autumn, but more valuable in winter and spring.

SEASON: late, keeping all winter.

WOODRUFF. (*Woodruff's Red.*)

An attractive red grape, which promises to be valuable.

ORIGIN: C. H. Woodruff, Ann Arbor, Mich., in 1874; a chance seedling, thought to be a cross between Catawba and Concord.

VINE: vigorous, hardy, productive; somewhat subject to black rot.

BUNCH: good size; shouldered; compact.

BERRY: large; round; red, with thin bloom; does not crack.

QUALITY: dessert, good.

VALUE: market, first class.

SEASON: about the same as Concord.

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WILDER. (*Rogers' 4.*)

Considered in many parts of Ontario the best black grape; but it is not so productive as Concord, nor as resistant of mildew.

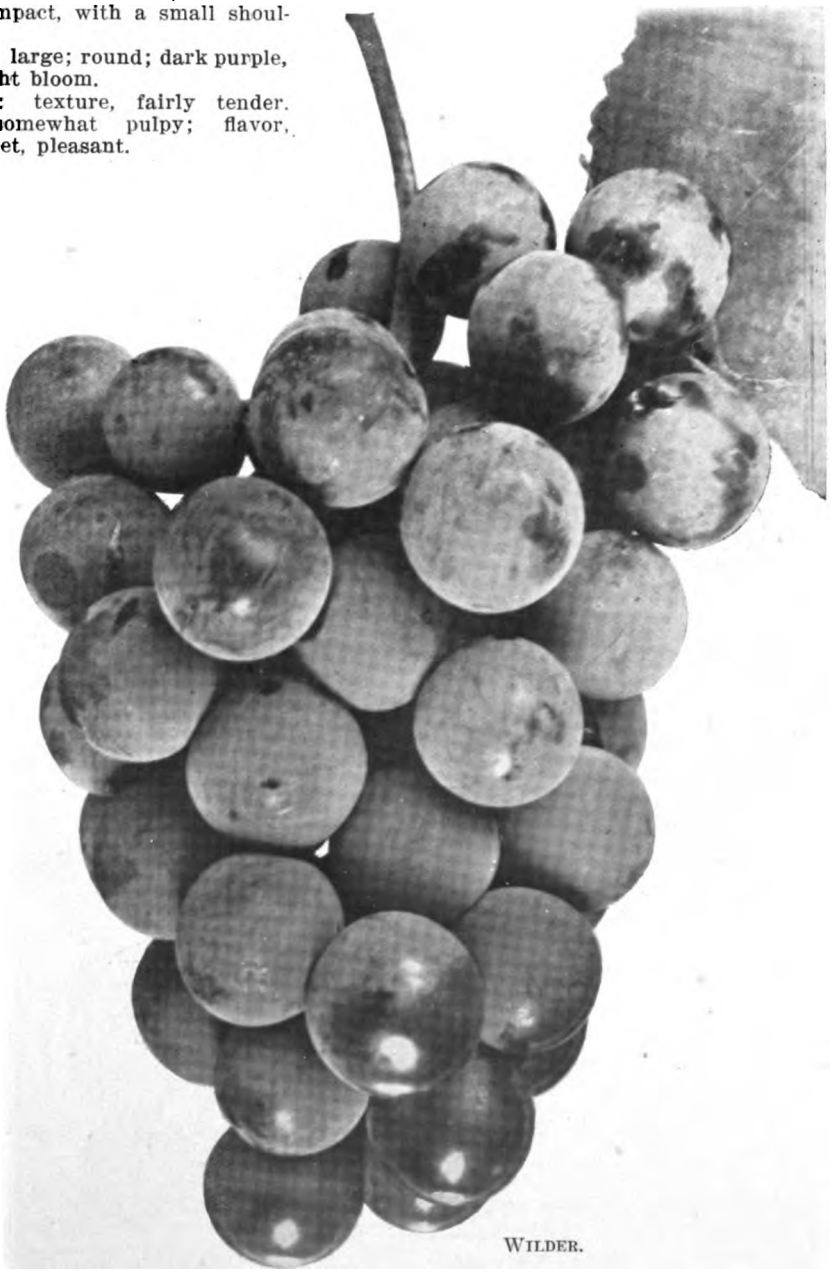
ORIGIN: a seedling raised by E. S. Rogers, of Salem, Massachusetts, and named in honor of Marshall P. Wilder, the late president of the Massachusetts Horticultural Society.

VINE: vigorous; somewhat inclined to mildew in unfavorable seasons; but otherwise healthy; canes, heavy and long, should have long pruning.

BUNCH: self sterile; medium size; compact, with a small shoulder.

BERRY: large; round; dark purple, with slight bloom.

FLESH: texture, fairly tender, juicy, somewhat pulpy; flavor, rich, sweet, pleasant.



WILDER.

QUALITY: dessert, very good.
VALUE: market, first class.
SEASON: medium.

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WINCHELL. (*Green Mountain.*)

The best white grape of its season for the dessert table. Not much planted for market.

ORIGIN: Green Mountains of Vermont, by a Mr. Winchell, after whom it has been very properly named; but, among fruit growers, the name Green Mountain has the preference.

VINE: hardy, healthy, only fairly vigorous and fairly productive.

BUNCH: compact; well shouldered.

BERRY: color, greenish white; size, medium; skin, thin; pulp, tender; flavor, sweet and excellent; seeds, few and small.

QUALITY: dessert, good.

VALUE: market, second class.

SEASON: early.

WINCHELL OR GREEN MOUNTAIN.

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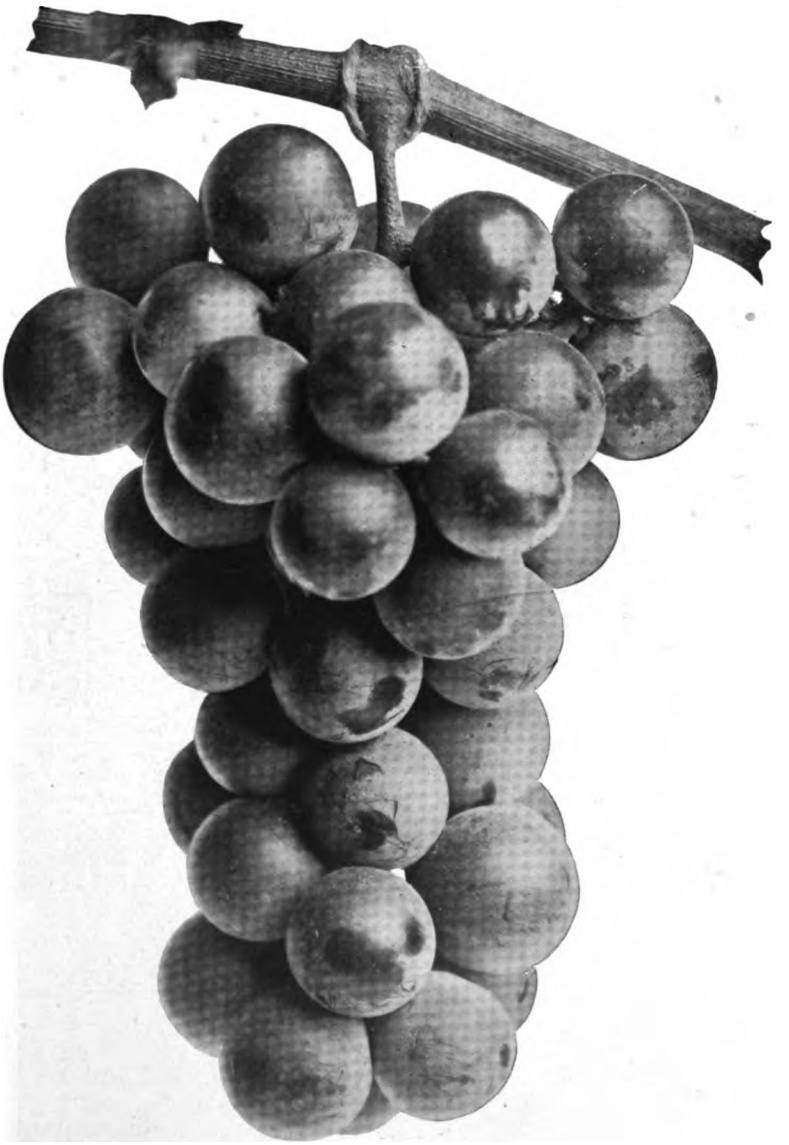
WORDEN.

The vines of the Worden are almost identical in character and appearance with its parent, the Concord.

When first introduced, it was thought to be superior to that variety for the main crop, but it has proved to be so only in its earliness, ripening a few days in advance.

ORIGIN: S. Worden, Minnettoo, N.Y., from Concord seed.

VINE: strong, vigorous grower, with coarse, stout foliage, dark green above, rusty underneath; very hardy, healthy and very productive.



WORDEN.

BUNCH: large, compact, shouldered.

BERRY: large, black; skin, tender, thin, with heavy bloom, cracks easily; flesh, sweet, when well ripened; pulp, tender, and loses flavor soon after ripening; a poor keeper.

QUALITY: fair for dessert purposes.

VALUE: near market, first class; berries too loose on stem for long shipments.

SEASON: early.

ADAPTATION: well suited to the northern sections, because of its early ripening.

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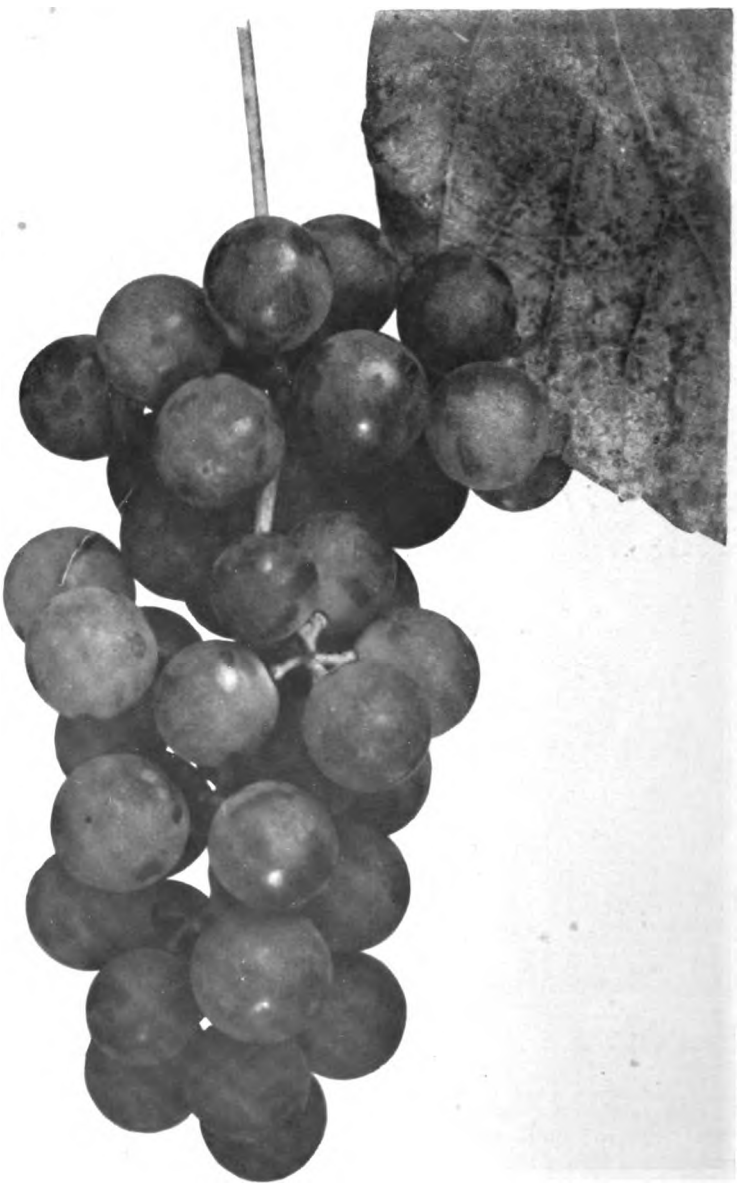
WYOMING. (*Wyoming Red.*)

An attractive early market grape; ripens before Delaware.
ORIGIN: Wyoming Valley, in Pennsylvania.
VINE: healthy; vigorous; hardy and fairly productive.
BUNCH: small; compact; attractive.
BERRY: size, medium; color, very bright red.
FLESH: texture, tender, juicy; flavor, sweet.
QUALITY: dessert, fair.
VALUE: market, first class.
SEASON: medium.



WYOMING.

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3. Bush Fruits

In Bush Fruits are included the Blackberry, Currant, Dewberry, Gooseberry, and Raspberry. These fruits, while not being of quite so much importance from a commercial standpoint as the tree fruits, are grown and consumed in very large quantities in Ontario, and as they are used in many ways by housekeepers there will always be a demand for them. They can be grown between the tree fruits to advantage while the latter are young and hence often augment the revenue of the fruit grower materially before the tree fruits come into full bearing.

Some idea of the large quantities of bush fruits which are grown will be obtained from the Dominion census statistics for 1911, where it is stated that there were at that time 13,940 acres devoted to small fruits in Ontario, on which were produced about 27,000,000 quarts, valued at $1,383,000.00. The strawberry is included in the above estimate. The present area devoted to small fruits is estimated at 15,000 acres.

THE BLACKBERRY

The blackberry is not grown so largely in Ontario as it might be. It is one of the most profitable fruits to grow where it succeeds well, but as the crop is rather uncertain except in southern Ontario and in localities farther north where it is protected by a deep snowfall, its range of successful culture is somewhat limited. Where there is not danger of winter killing, a well drained clay loam is probably the best for the blackberry, as it is cooler and more retentive of moisture than lighter soils. The blackberry must have plenty of soil moisture when the fruit is ripening, otherwise but little of the crop will develop. Further north, where hardiness is of greater consideration than conservation of moisture, the poorer and warmer soils are preferred, as the blackberry on these soils does not make as rampant a growth and hence ripens its wood better.

The blackberry may be planted in late fall or early in the spring. If planted too early in the fall young growth may start which is likely to be winter killed. The soil should be well prepared and the plants set a little deeper than they were in the nursery, in rows about eight feet apart and three feet apart in the rows. Some growers prefer planting them in hills seven or eight feet apart each way, thus finding them easier to control. Larger fruit is so produced as they can be kept cultivated both ways. Summer pruning is important with the blackberry, as the lower the canes can be kept the better they are likely to come through the winter, and the easier they are to handle. Summer pruning consists in merely pinching back the young growth to within about eighteen inches of the ground, after which side shoots will be thrown out. It is better to err on the side of low pinching than to let the canes get too tall. This summer pruning may, if delayed, cause late growth, which will not ripen; hence it should be done in time or not at all. In the spring the laterals should be headed back to within eighteen inches or two feet of the main canes. Old canes and the weakest of the new ones should be cut out in the fall or early in the spring each year. There will be a light crop of fruit the second year and a full crop the third year. Four or five full crops are about as much as should be taken from one plantation.

Blackberries should not be picked until they are ripe. This fruit will never increase in popularity if fruit growers persist in marketing green blackberries, as they are quite unpalatable, whereas the ripe fruit has a fine flavor.

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VARIETIES RECOMMENDED.

General List, approved by the Board of Control.

Agawam, Snyder, and for southern sections, Kittatinny.

DISTRICT LISTS.

FONTHILL DISTRICT

(Including Townships of Pelham, Stamford, and Thorold).

G. C. Brown, Fonthill.

Eldorado, Snyder.

BURLINGTON-OAKVILLE DISTRICT

(Including the southern part of the counties bordering on Lake Ontario between Hamilton and Toronto).

A. W. Peart, Burlington.

Snyder, Western Triumph, Agawam.

ESSEX PENINSULA

(Including Essex, Kent, and Pelee Island).

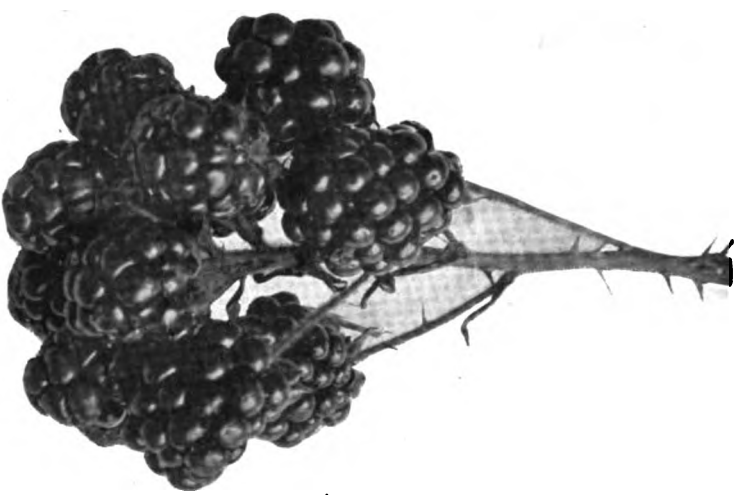
J. L. Hilborn, Leamington.

Mersereau, Eldorado, Kittatinny.

DESCRIPTION OF VARIETIES

AGAWAM.

A profitable variety, and a favorite for the table.
ORIGIN: found growing wild by John Perkins, Ipswich, Mass., about 1870.
PLANT: hardy, vigorous, and productive; resistive of drouth.
BERRY: oblong, medium size, black, sweet, tender and of good flavor.
SEASON: early.
ADAPTATION: succeeds in nearly all fruit sections; one of the hardiest varieties, and therefore planted in northern sections in preference to Kittatinny.



AGAWAM.

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BRITON (*Ancient Briton*).

Counted one of the best varieties where it succeeds; it is a special favorite with fruit growers in Wisconsin, in which State it originated.

ORIGIN: a Wisconsin seedling found by A. H. Briton; first mentioned in the Report of the Wisconsin Horticultural Society, 1869.

PLANT: hardy, vigorous and fairly productive. Budd, in his "Systematic Pomology," speaks of it as one of the hardiest varieties yet tested.

BRITON.

BERRY: medium to large; form oblong, conical; texture, melting; flavor very pleasant.

SEASON: medium.

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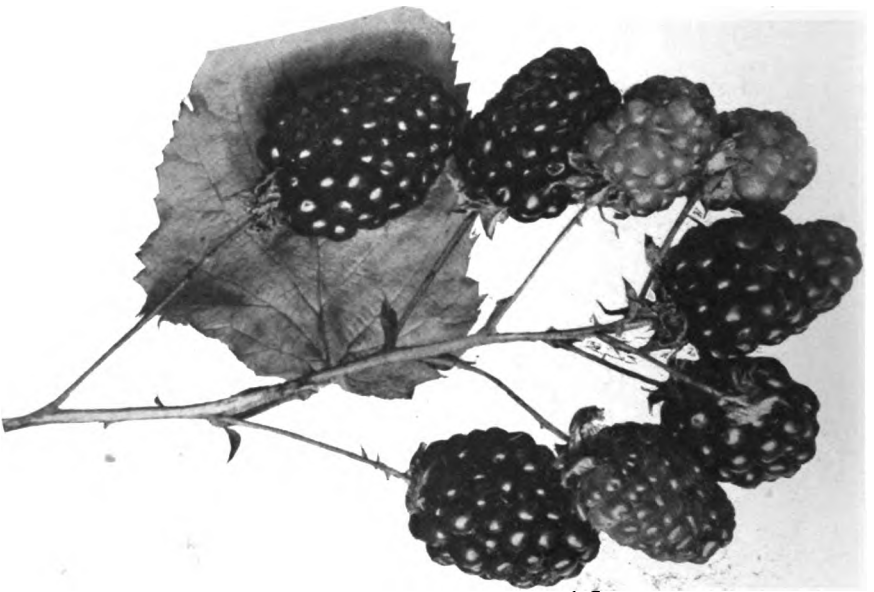
ELDORADO.

A hardy and productive variety.

ORIGIN: accidental seedling near Preble, Ohio, about 1882.

BUSH: a strong, vigorous grower; healthy; hardy; moderately productive.



ELDORADO.

BERRY: medium to large; oblong, conical, irregular; drupes large; seeds and core small; flavor sprightly, pleasant.

QUALITY: table, very good.

VALUE: market, first class.

SEASON: early.

ERIE.

A variety much like the old Lawton; has not become popular in the commercial plantations of Ontario.

ORIGIN: Ohio, on the farm of L. B. Pierce, who thinks it is a cross between Lawton and Kittatinny; introduced by J. T. Lovett in 1886.

BUSH: fairly vigorous; fairly hardy; productive.

BERRY: form roundish, oblong; size medium; color black; flavor fairly good.

QUALITY: cooking, good.

VALUE: market, second class.

SEASON: medium.

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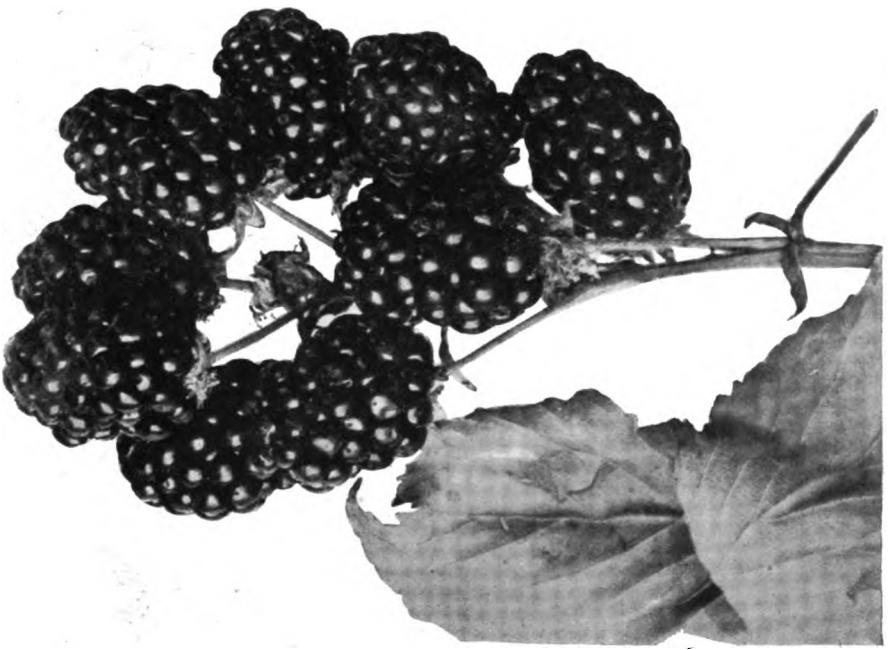
KITTATINNY.

This has been the favorite blackberry in Ontario for both home use and market. Unfortunately, it is subject to Orange Rust. for which as yet there is no certain remedy, and in some places fruit growers have given up this variety on account of it.

ORIGIN: Kittatinny Mountains, N.J.; found growing wild by a Mr. Woolverton in 1874, but not much disseminated until many years later.

PLANT: very vigorous, but tender outside of the peach belt; productive; propagated by suckers and by root cuttings.



KITTATINNY.

BERRY: large, oblong, slightly conical; shiny black when ripe, becoming gradually duller after gathering; flesh moderately firm, sweet, rich and excellent.

QUALITY: good for dessert; very good for cooking.

VALUE: first class for home market.

SEASON: medium to late.

LAWTON.

A variety that has done much to popularize the blackberry as a market fruit, but now supplanted by other and better kinds. In some markets all varieties of blackberries go under the name of Lawton.

ORIGIN: introduced by Wm. Lawton, of New Rochelle, N.Y., in 1848.

BUSH: vigorous; hardy; productive; canes very spiny.

BERRY: large; oblong; color jet black when fully ripe, but if gathered sooner it is reddish; texture soft and juicy at full maturity, otherwise it has a hard core, and is sour and insipid; flavor sweet and excellent when quite ripe, but in this condition rather soft for shipment.

QUALITY: cooking, good.

VALUE: market, second class.

SEASON: medium

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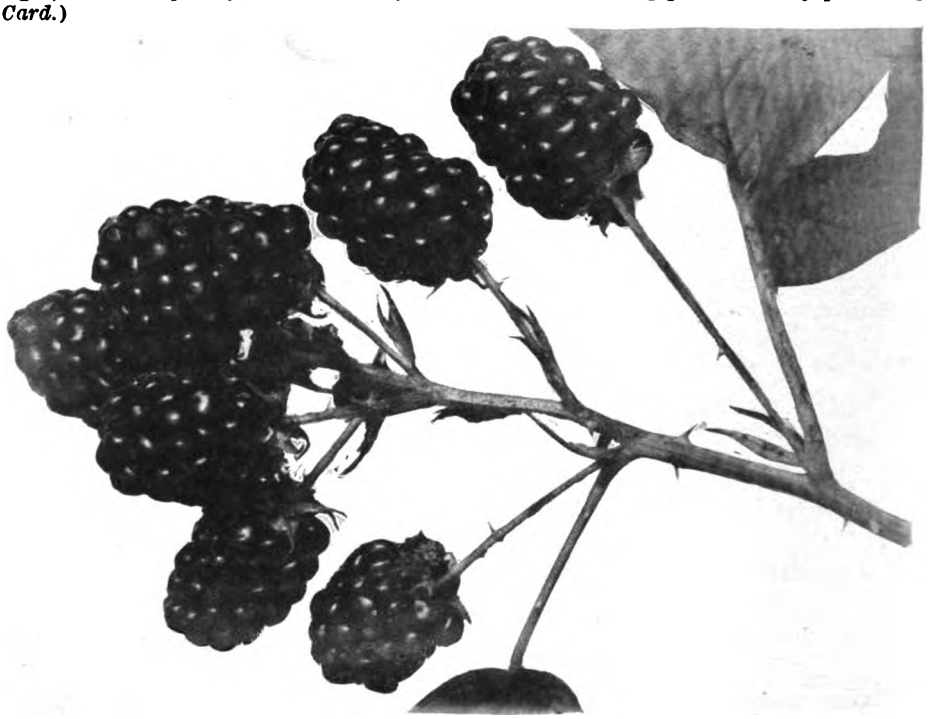
LAWTON.

MERSEREAU.

"Originated with J. M. Mersereau, Cayuga, N.Y. It resembles the Snyder, but is larger, of better quality, and less likely to turn red after being picked. Very promising." (*Card.*)



MERSEREAU.

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MINNEWASKI.

Introduced with great flourish, but it has proved disappointing, except in the place of origin, because tender and unproductive.

ORIGIN: by A. J. Caywood, of Marlboro, N.Y.

PLANT: a stout, vigorous, upright grower, but unproductive and tender.

BERRY: large, oblong, dull in color, and of fair quality.

SEASON: medium.

OHMER.

An excellent late blackberry, for home use and for market.

ORIGIN: a chance seedling, found by N. Ohmer, of Ohio.

BUSH: vigorous; spreading; very productive.

FRUIT: roundish; black; large; firm without core; juicy; flavor mild, pleasant.

QUALITY: second rate.

VALUE: market, first class.

SEASON: medium.

SNYDER.

A popular variety in the commercial fruit garden, because of its productiveness; very reliable in the colder sections, but not desirable for the table because of its inferior quality.

ORIGIN: on farm of Henry Snyder, near Laporte, Indiana, about the year 1851.

PLANT: a vigorous, stout, upright grower, hardy and very productive.

BERRY: medium size, roundish, firm and carries well.

SEASON: medium.

SNYDER.

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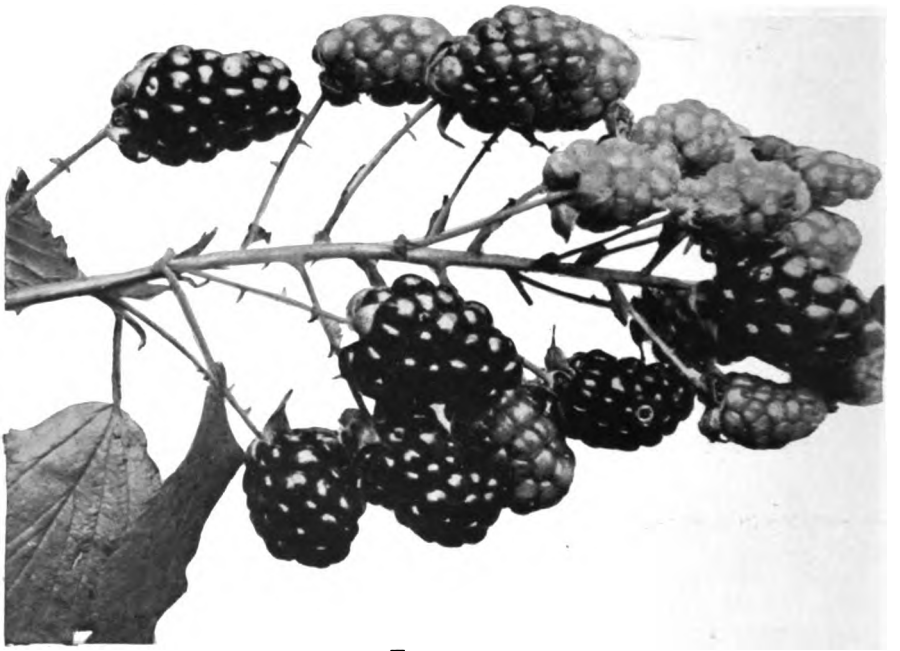
TAYLOR (*Taylor's Prolific*).

A valuable commercial berry for colder sections, its season being later than Snyder.

ORIGIN: introduced by Mr. Taylor, of Spiceland, Indiana, about the year 1867.

BUSH: hardy, vigorous, and productive.



TAYLOR.

BERRY: large; roundish oblong; texture soft, juicy; flavor rich, moderately sweet.

SEASON: medium to late.

TRIUMPH (*Western Triumph*).

A good market berry, if grown on favorable soil.

ORIGIN: a chance seedling, found in Illinois, on the prairie, in 1858.

BUSH: moderately vigorous; very productive, inclined to overbear; requires moist bottom and close pruning for best results; semi-hardy.

BERRY: size medium; form roundish oblong; drupelets coarse; flavor sprightly, rich and sweet, without core.

QUALITY: fair.

VALUE: market, first class.

SEASON: medium to late.

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WACHUSETT.

This blackberry was first introduced as Wachusett's Thornless, on account of its comparative freedom from spines. This, however, is the chief point in its favor, as the plant is not productive enough to be of value to the Ontario fruit grower.

ORIGIN: a wild plant on Monadnock Mountain, Massachusetts.

BUSH: a slow grower, at first upright, afterward drooping; healthy, not very productive; spines few; fruit clusters few.

BERRY: size medium; form roundish, moderately firm, of good quality.

VALUE: market, second class.

SEASON: early to medium.

WILSON.

Has been a popular variety in New Jersey. It demands close pruning in order to prevent overbearing, and must be covered for winter protection in most sections.

ORIGIN: John Wilson, of Burlington, N.J., about 1854.

PLANT: vigorous; productive; in form, partaking of both the low and the high bush blackberries.

BERRY: large; firm; somewhat irregular, tapering towards the apex; grains mostly large but with some smaller ones mixed in; flavor quite acid until ripe, when it is rich and sprightly.

SEASON: medium.

WILSON.

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THE CURRANT

The currant is a very hardy fruit, and for this reason can be grown with success all over the Province of Ontario, and as fair results are obtained without high culture, almost everyone who has a garden grows currants. Like all other fruits, however, the currant becomes most profitable when given good care.

The currant is a moisture-loving fruit, hence for profit it should be planted in a cool, moist, but well-drained soil. It also requires rich soil, hence as a rule the best is a good clay loam which is retentive of moisture and cooler than sandy loam. The soil should be thoroughly prepared for currants before planting. One year old plants from cuttings, if strong, will give good satisfaction, although two year old plants are not too old. They should be planted in rows about six feet apart, and from four to five feet apart in the rows, the wide distance being more satisfactory for the strong growing varieties and especially black currants. Fall planting is best for currants, as the buds start very early in the spring and should these develop before they can be planted, their future growth will be checked. They can, however, be planted in the spring with success. The plants should be set a little deeper than they were in the nursery, and the soil well pressed against the roots. Thorough cultivation should follow to promote as much growth as possible, but it should be shallow, as the currant roots are near the surface. The following spring the currants will need some pruning to give them a shapely open head, the bush when well shaped having from five to seven main branches well distributed to avoid crowding. The fruit of red currants is formed from spurs on wood two years old, while the fruit of black currants is borne on wood of the previous year. Currants should be pruned annually to get the best results.

After the bushes are in full bearing, the pruning should be done with the object of removing some of the young and some of the older wood from the ground each year. There should be no wood more than three years old left on black currant bushes, as the object is to keep up a strong growth of young wood. It is also not well to let the wood of red currants get very old, as the finest fruit is produced on the two and three year old wood.

The currant plantation will begin to give some fruit the third season, but a full crop will not be obtained until the fourth.

As the currant is a gross feeder, drawing heavily on the fertility of the soil, the plantation should receive an annual dressing of barnyard manure or some other fertilizer. Rotten manure applied in the autumn and cultivated in the next spring gives very good results. Applications of wood ashes or muriate of potash and ground bones are also beneficial.

VARIETIES RECOMMENDED.

General List, approved by the Board of Control.

Black: Black Victoria, Champion, Lee, Boskoop Giant, Saunders.
Red: Cherry, Fay, Red Cross, Victoria, Wilder.
White: Grape.

DISTRICT LISTS.

FONTHILL DISTRICT

(Including Townships of Pelham, Stamford and Thorold).

G. C. Brown, Fonthill.

Red: Cherry, Perfection, Prince Albert.

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BURLINGTON-OAKVILLE DISTRICT

(Including the southern part of the counties bordering on Lake Ontario between Hamilton and Toronto.)

A. W. Peart, Burlington.

Black: Lee, Naples, Saunders, Champion, Victoria.
Red: Cherry, Fay, Pomona, Wilder, Victoria.
White: Grape, Imperial.

W. F. W. Fisher, Burlington.

Black: Champion, Victoria, Boskoop Giant.
Red: Cherry, Fay, Wilder.

ESSEX PENINSULA

(Including Essex, Kent and Pelee Island).

J. L. Hilborn, Leamington.

Black: Victoria, Champion.
Red: Cherry, Fay, Wilder.
White: Grape.

J. Atkin & Son, Leamington.

Red: Fay, Red Cross, Perfection, Loudon.
Black: Victoria, Saunders, Lee.

LAKE HURON DISTRICT

(Including Counties of Huron and Bruce).

D. F. Hamlink, Goderich.

Black: Champion, Naples, Saunders, Victoria.
Red: Fay, Cherry, Perfection, Albert.
White: Grape.

GEORGIAN BAY DISTRICT

(Including northern portions of the Counties of Grey and Simcoe, bordering on the Georgian Bay).

J. G. Mitchell, Clarksburg.

Black: Lee, Champion.
Red: Cherry, Fay.
White: Grape.

LAKE SIMCOE DISTRICT

(Including the northern and eastern section of Simcoe and northern sections of York and Ontario bordering on Lake Simcoe).

G. C. Caston, Craighurst.

Black: Naples, Victoria.
Red: Fay, Versailles, Cherry.
White: Grape.

GUELPH DISTRICT

(Including the high inland Counties of southwestern Ontario, *i.e.*, Wellington, Waterloo, northwestern section of Perth, south part of Grey, Dufferin, and northwest section of Peel and Halton).

Prof. J. W. Crow, O.A.C., Guelph.

Black: Victoria, Champion, Saunders.
Red: Red Cross, Victoria, Fay.
White: Grape.

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OTTAWA DISTRICT

(Including the Ottawa Valley and the eastern portion of the Province not elsewhere enumerated, south of latitude 46 deg.).

W. T. Macoun, Horticulturist, Central Experimental Farm, Ottawa.

Black: Saunders, Collins Prolific, Black Victoria. Boskoop Giant is very promising.
Red: Pomona, Victoria, Dutch and Wilder in the most favored parts.
White: Grape.

ALGOMA DISTRICT.

(Including the islands of Manitoulin and St. Joseph and a limited portion of the northern and eastern shore of the Georgian Bay).

Chas. Young, Richard's Landing.

Black: Saunders, Champion, Victoria.
Red: Dutch, Versailles.
White: Grape.

DESCRIPTION OF VARIETIES

BLACK VICTORIA.

BUSH: upright, of medium vigor, healthy, hardy and productive.

BERRY: large, black, firm, sweet.

QUALITY: fine.

SEASON: medium.

BLACK VICTORIA.

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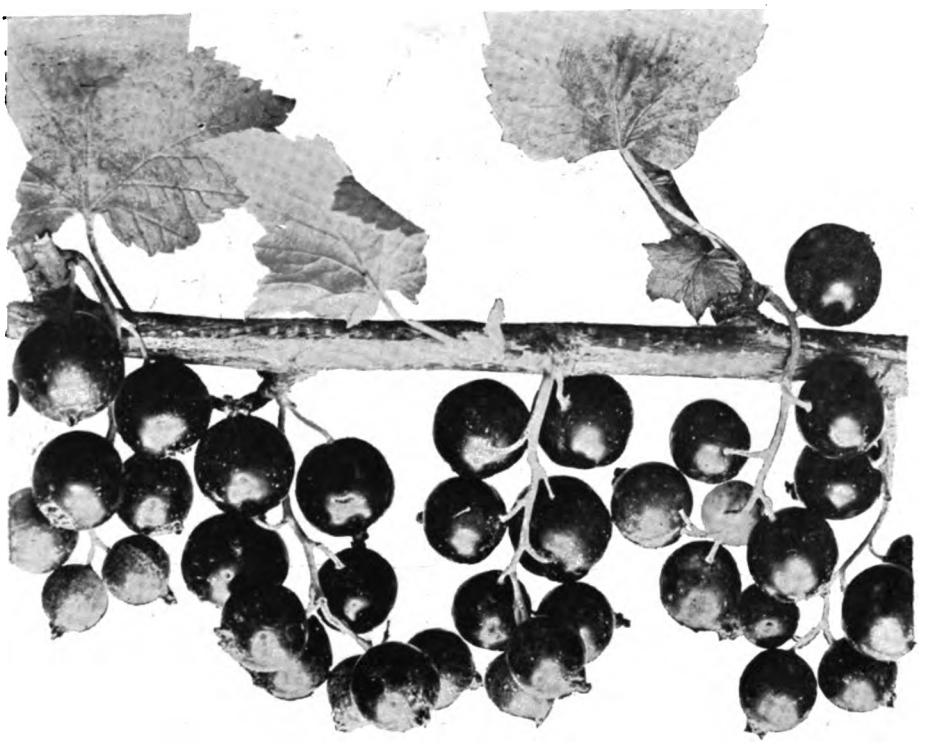
BRAYLEY.

BUSH: upright, spreading, vigorous, healthy, hardy; not very productive.
BUNCH: long, straggling, loose.
BERRY: dark red in color; size medium; flavor acid, sprightly.
SEASON: medium.

CHAMPION.

ORIGIN: England.
BERRY: black, round, very large; good to very good.
VALUE: good.



CHAMPION.

CHATAUQUA.

ORIGIN: New York State.
PLANT: vigorous; very producitve.
BUNCH: long; compact.
FRUIT: deep, bright red; about size of the Cherry currant; flavor acid.
QUALITY: good.
VALUE: market, first class.
SEASON: medium.

CHERRY (*Red Imperial, Fertile d'Angers of LeRoy*).

The principal red currant grown in Southern Ontario for commercial purposes. Its large size, fine color and earliness, combine to make it the most satisfactory of all varieties for market, and many acres have been set out for this purpose. When well cultivated and well pruned back, a plantation of Cherry currants will continue very productive for at least twelve or fifteen years.

ORIGIN: Italy; introduced into the United States in 1846.

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PLANT: vigorous, a stout, stocky grower; very productive; begins bearing the second year after planting; foliage thick, dark green.

BUNCH: usually short, but sometimes long and tapering, compact.

BERRY: very large, globular; bright red in color; flavor subacid; texture firm.

QUALITY: fair.

VALUE: first class for market and for jellies.

SEASON: medium to late.

ADAPTATION: general, but succeeds better on clay loam than upon light sand.

CHERRY.

CLIPPER.

BUSH: a strong grower and productive.

BUNCHES: large.

FRUIT: medium to large; skin moderately thick, tender; briskly subacid and of good flavor.

QUALITY: good; ripens somewhat unevenly.

SEASON: medium to late. Promising. (Macoun.)

CLIPPER.

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CRANDALL.

This interesting currant is of very doubtful value for the currant plantation, for canning. It is of the *Ribes aureum* type, or flowering currant, and was produced from seed of that variety by Mr. Crandall.

ORIGIN: Kansas.

BUSH: upright, spreading, hardy, healthy, vigorous, rampant and moderately productive.

BUNCH: short, compact.

BERRY: variable in size; bluish black; skin thick; flavor sprightly, subacid.

SEASON: medium to late; ripens unevenly, some of the later berries hanging until frost.

ECLIPSE.

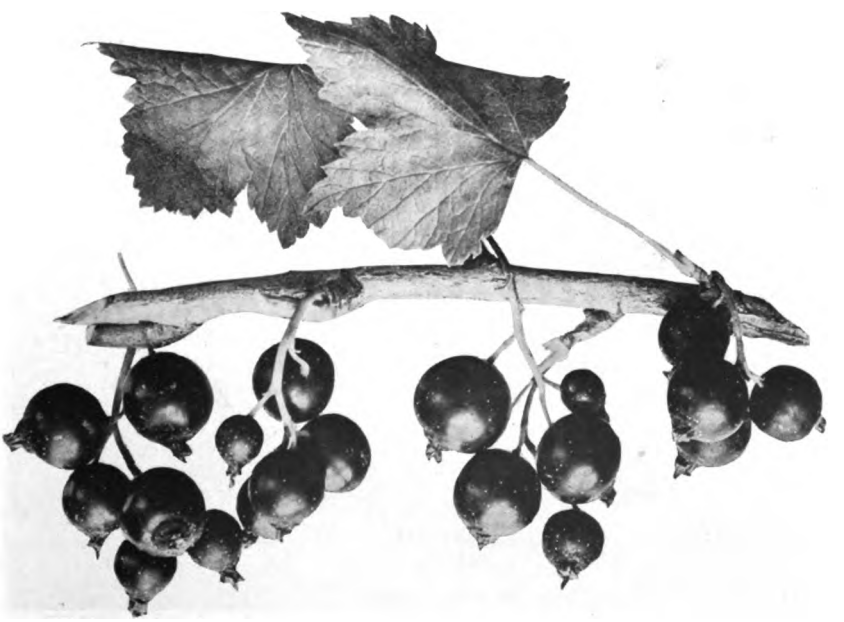
BUSH: a medium to strong grower and productive.

BUNCHES: large.

FRUIT: medium to large; skin moderately thick, fairly tender; subacid.

QUALITY: good; ripens evenly.

SEASON: early. Promising on account of productiveness, size and quality. (*Macoun.*)



ECLIPSE.

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FAY (*Fay's Prolific*).

A variety that has been much advertised as superior to the Cherry, but, as a matter of fact, is very similar in fruit and in productiveness.

ORIGIN: New York State.

BUSH: vigorous, but sprawling, and somewhat subject to the borer where the shoots are not frequently renewed; productive.

BUNCH: moderately close, loose toward the base.

BERRY: very large, globular; bright red; firm; flavor subacid.

QUALITY: good.

VALUE: first class for market.

SEASON: medium to late.

FAY.

HOLLAND (*White Holland, Long Bunched Holland*).

The best bunched and the most showy of the white currants.

BUSH: vigorous, healthy and quite productive.

BUNCH: loose at base of racemes, close toward apex.

BERRY: globular; skin thick, white; flavor mild acid.

SEASON: medium.

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KERRY.

BUSH: a strong grower and very productive.

BUNCHES: medium to large.

FRUIT: above medium to large; skin thick but tender; briskly subacid.

QUALITY: above medium to good.

SEASON: medium to late. One of the most promising for commercial purposes on account of its great productiveness and good size of fruit. (*Macoun.*)

KERRY.

LONDON (*London Market*).

One of the most promising of the new varieties for all purposes.

ORIGIN: England.

BUSH: very vigorous, healthy; very productive.

BUNCH: comparatively compact.

BERRY: color red; quality fair.

VALUE: very good for both kitchen and market.

SEASON: medium.

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LEE.

A good commercial variety.

ORIGIN: England.

BUSH: moderately vigorous, healthy, hardy and moderately productive.

BERRY: black, very large; flavor subacid; quality very good.

SEASON: medium.

LEE.

MIDDLESEX (*Saunders' 12*).

ORIGIN: with Dr. Saunders, Ottawa, Canada.

BUSH: very vigorous, healthy; very productive.

BUNCH: compact.

BERRY: round; skin jet black, thick; flavor good.

VALUE: first class for cooking and market.

SEASON: medium.

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NAPLES.

One of the best market varieties of black currants.
ORIGIN: Europe.
BUSH: upright, strong, vigorous, hardy, healthy and very productive.
BERRY: large, black, subacid.
QUALITY: good.
SEASON: medium to late.

NAPLES.

NORTH STAR.

ORIGIN: Minnesota.
BUSH: vigorous, healthy, moderately productive.
BUNCH: compact.
BERRY: round; skin thin, bright red; subacid.
QUALITY: cooking, very good.
VALUE: second class on account of size, but, season and productiveness considered, it might be rated first class.
SEASON: medium to late.

POMONA.

"An Indiana variety, introduced by Albertson & Hobbs, of Bridgeport, Indiana. Claimed to be more prolific, with fewer seeds, and sweeter than any other currant; clear, bright red, about the size of Victoria; easily picked, and hangs a long time on the bushes." (*Card.*)

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NORTH STAR.

POMONA.

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PRINCE ALBERT.

PRINCE ALBERT.

One of the most profitable red currants; excellent for canning.

BUSH: a poor grower while young, but as it grows older quite vigorous and productive. Beach, of Geneva, N.Y., in a three years' test found this the most productive currant in his collection, yielding, during that period, an average of about nine pounds per bush; leaves large and deeply cut.

BUNCH: short to medium length.

BERRY: size medium; color light red; flavor very acid.

QUALITY: first class for cooking or jelly.

VALUE: market, first class.

SEASON: late.

RED CROSS.

Very much resembles Cherry, but somewhat poorer in bunch.

ORIGIN: New York State, probably a cross between the Cherry and the White Grape.

BUSH: upright; vigorous; hardy; fairly productive.

BUNCH: compact.

BERRY round; color bright red; flavor fairly good, agreeably acid.

SEASON: medium.

RED CROSS.

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ST. GILES (*Belle de St. Giles*).

This is a large berry of fine quality, but not productive enough for the commercial plantation.

ORIGIN: Europe.
BUSH: upright, spreading; vigor medium; hardy, not very productive.
BUNCH: large and compact.
BERRY: red, large, subacid.
QUALITY: excellent.
SEASON: medium.

ST. GILES.

RED DUTCH.

Too small for the commercial plantation; fine flavor for dessert.

ORIGIN: Europe.
BUSH: dwarfish, slender; hardy; very productive.
BUNCH: medium; loose.
BERRY: small, oblate, sprightly, subacid, pleasant.
VALUE: second class for market.
SEASON: medium.

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SAUNDERS.

A very promising black currant.
ORIGIN: London, Ontario, by Dr. Wm. Saunders.
BUSH: vigorous; hardy; healthy; productive.

SAUNDERS.

BERRY: large; black; flavor sweetish or subacid.
QUALITY: very good.
VALUE: market, first class.
SEASON: medium.

VICTORIA.

A good commercial variety.
ORIGIN: England.
BUSH: very vigorous; hardy; very productive.
BUNCH: long, loose.
BERRY: medium; color red; firm; flavor acid.
VALUE: market, first class.
SEASON: medium.

VERSAILLAISE.

This variety closely resembles Cherry.
ORIGIN: France.
BUSH: healthy, hardy, fairly vigorous and fairly productive.
BUNCH: medium and moderately compact.
BERRY: round; bright red; flavor milder than that of the Cherry.
VALUE: market, first class.
SEASON: medium to late.

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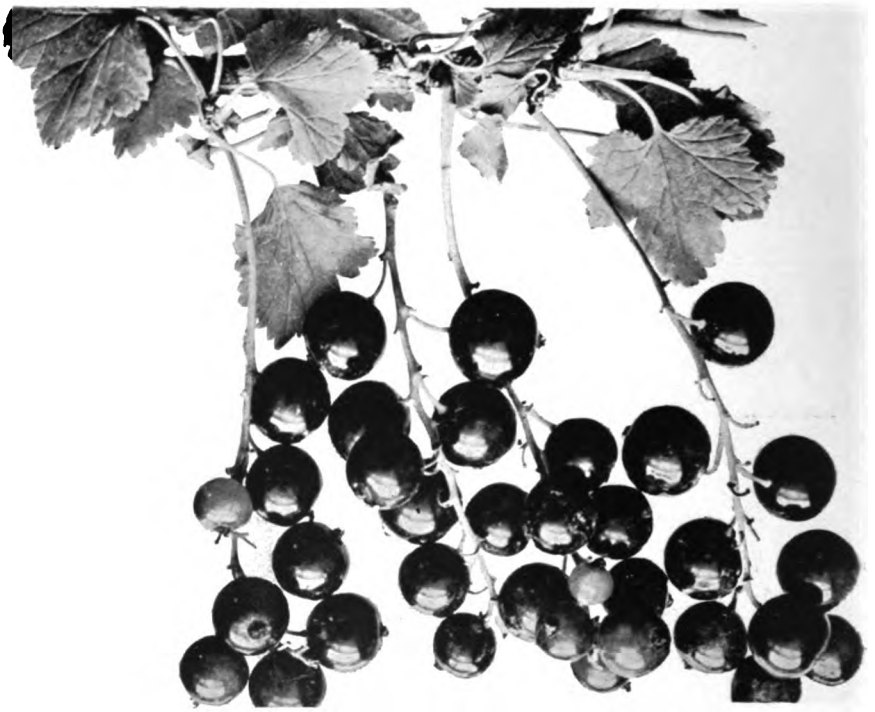
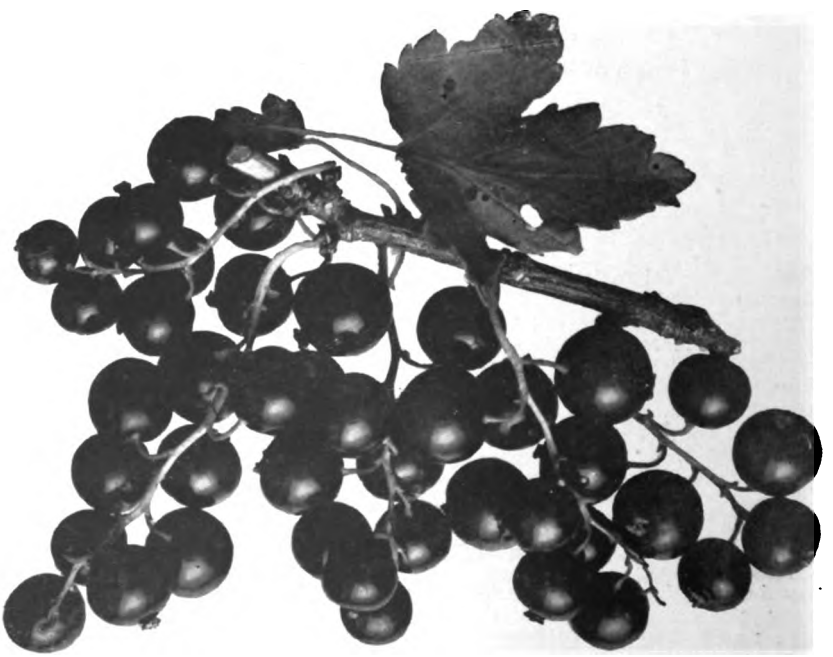


VICTORIA.



VERSAILLAISE.

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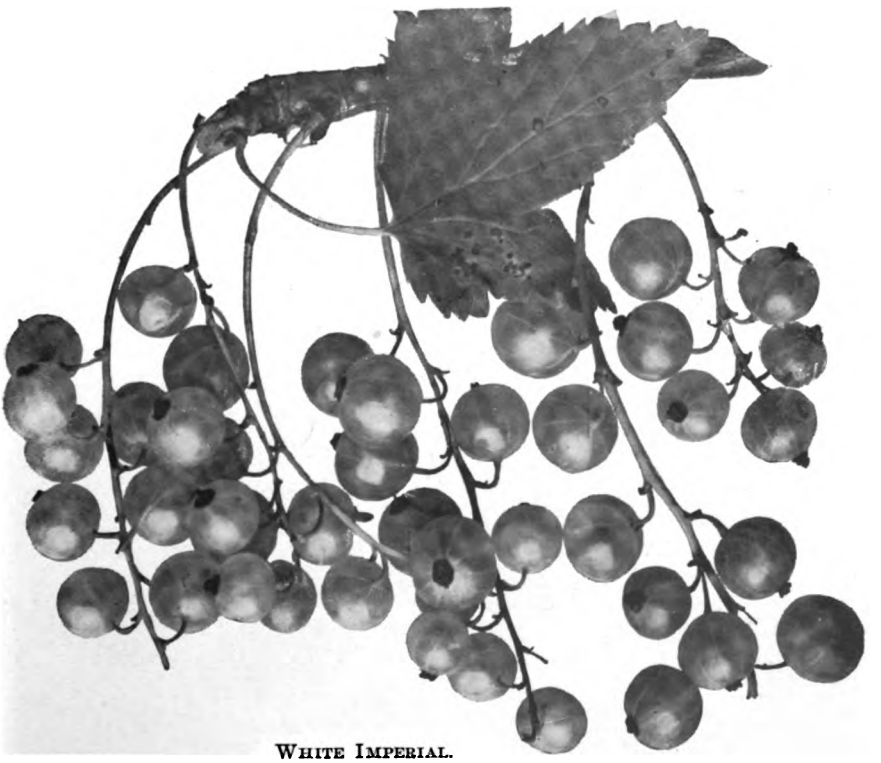
WHITE GRAPE.



WHITE IMPERIAL.

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WHITE GRAPE (*White Antwerp; White Transparent*).

This is esteemed the finest of all the white currants, when its many good points are taken into consideration, viz., quality, beauty and productiveness. For market, its white color is against it, but for the home garden it is one of the best.

ORIGIN: Europe.
BUSH: moderately vigorous; hardy; very productive.
BUNCH: somewhat straggling.
BERRY: skin white, transparent; flavor mild acid, sprightly, agreeable
QUALITY: best for dessert.
VALUE: first for market.
SEASON: medium.

WHITE IMPERIAL.

BUSH: vigorous, hardy, healthy and fairly productive.
BUNCH: loose, with half an inch of stem.
BERRY: white; flavor mild; quality fine.
QUALITY: dessert, very good.
SEASON: medium.

WILDER.

This is one of the best of the red currants and has given an excellent record at our Burlington station. It is highly recommended in a recent report of the American Pomological Society.

ORIGIN: New York State, named in honor of the late Marshall P. Wilder.

BUSH: healthy, hardy and very productive.

BUNCH: compact.

BERRY: dull red; form uneven; mild in flavor; of good quality.

VALUE: first class for market.

SEASON: medium.

WILDER.

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THE DEWBERRY

As a cultivated fruit the dewberry is of such recent introduction into American horticulture that it can scarcely be said to have a history. As late as 1884 the dewberry was not cultivated for sale by nurserymen. It was not until the introduction of the Lucretia, which was brought into general notice about 1886, that the dewberry began to occupy any prominent place in American horticulture.

The dewberries are distinguished from the blackberries chiefly by their trailing habit of growth, their early ripening and the method of propagation. There are important differences also in the flower cluster which need not be discussed here. The dewberries propagate by means of tips, while the blackberries propagate by suckers, a point of much practical importance in cultivation.

The market of the dewberry is limited by the short life of the berry in transit. It cannot be shipped any great distance, but should be on the market within thirty-six hours after picking. The value of the dewberry lies in its early ripening.

A cool climate and a high elevation seem to suit the dewberry best. Lower elevations are not so well adapted to the culture of this fruit on account of the extreme heat of summer, the berries being short and seedy as compared with the long luscious berries grown at higher altitudes. The fruit seems to develop best where the maximum temperature is not above 90°, and probably maximum temperature is a better guide than elevation. However, severe, drying winters may prove too trying for dewberries in localities otherwise well adapted to their culture.

SOILS AND LOCATIONS: The dewberry will grow well on a variety of soils, but considered from the standpoint of both ease of culture and adaptability, light sandy soils, free from rock or gravel, are best suited to its culture. As the dewberry seems to favor a cool climate much may be gained by choosing a cool, northern exposure.

PLANTING: Spring setting is the usual method, but there seems no reason why the plants should not be set in the fall if they are protected during the winter. Planting in the fall should be done in September, and spring planting as soon as the ground can be worked.

The question of the distance apart at which they are to be placed will be largely determined by the method of training to be employed. If to be trained to single stakes, four feet apart each way will be found satisfactory; if to wire trellises, six feet by perhaps three feet in the row will be more convenient. If the plants are to be allowed to grow practically prostrate, which is the natural method of growth, they will need to be set five feet apart each way. The objection to this method is that more space is demanded for training the plants than is needed for their maintenance.

CULTIVATION: The cultivation of the dewberry patch should not be unlike that for any other bush fruit. Cultivation stops at the opening of the picking season and is resumed again at its close, continuing until the end of the growing season. Since deep cultivation, which disturbs or breaks the roots, tends to start objectionable plants in the middles, the early cultivations and possibly the later ones should be shallow. If the plants are allowed to run for the purpose of being trained on a trellis, cultivation must be in one direction.

HARDINESS: The inherent hardiness of the dewberry may not be equal to that of many varieties of the blackberry, yet its prostrate habit of growth tends to afford it protection, which enables it to withstand the cold of winter, in most cases, as well as blackberries. The older canes will naturally be cut away before winter and the younger canes, which lie directly on the ground, are in the most convenient position possible for being covered with soil or mulch if such protection is necessary.

VARIETIES: The Lucretia is the best known of all the dewberries. As sent out, this variety has been greatly mixed, but the true type is a large fruit, productive, of good quality, and gives satisfaction wherever the dewberry succeeds.

Another variety, Mayes, seems to be one of the most promising varieties now grown.

Aughinbaugh is one of the best known varieties of the western dewberries, and is especially noteworthy as being the parent of the Loganberry, which has attracted so much attention in the west of late.

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THE GOOSEBERRY

The gooseberry and the currant are the two hardiest bush fruits which are cultivated, and the gooseberry, like the currant, succeeds in all parts of the Province, although the hardy gooseberries are confined to the varieties derived from the native species and to crosses between the native and the European. The European varieties are only grown successfully in favored locations as in most places they are very subject to mildew.

The gooseberry, like the currant, requires a cool, moist, though well-drained soil to give the best results, and suffers more than almost any other fruit in a dry time. These cool, moist conditions are best obtained as a rule by planting in a well-drained friable clay loam. The soil should be thoroughly prepared, as although the gooseberry will give a fine crop of fruit, even if not well cared for, the size will be small. Gooseberries may be planted with success either in spring or fall, but the fall planting is preferable, as growth begins early and plants usually receive a severe check if planted in the spring.

A good distance for planting is six by four or five feet. As gooseberries and currants are usually planted together, it is best to give them both the same distance, so that cultivation will be easier. The soil should be well cultivated every year to retain moisture. As the gooseberry makes much more wood each year than is needed, annual pruning is necessary.

The pruning should be begun before growth starts the second year, and with the object of obtaining an open bush having four or five main fruiting branches well distributed. The annual pruning should consist of removing most of the young branches, leaving a few of the best to take the place of some of the older ones later on and removing enough of the laterals to open up the head.

The gooseberry produces its fruit on spurs on wood two or more years old, hence there should always be a fair amount of this wood. Wood more than three years old should be removed to give place to that which is younger and which will bear better fruit.

The soil should be well fertilized and treated in this respect much like the currant.

The bushes will bear some fruit in the third season and should have a full crop in the fourth.

Although in England and Europe ripe gooseberries are highly esteemed, few of them are eaten raw in Ontario, hence this fruit is usually picked green and used for sauce, canning and pies. Being firm, it ships well and is usually a profitable crop.

Varieties Recommended.

General List, approved by the Board of Control.

American Varieties: Pearl, Downing, Red Jacket.
English Varieties: Crown Bob, Whitesmith, Industry, Keepsake. Not recommended on account of mildew, unless to be thoroughly sprayed with the lime sulphur mixture.

DISTRICT LISTS.

Burlington-Oakville District

(Including the southern part of the counties bordering on Lake Ontario between Hamilton and Toronto).

A. W. Peart, Burlington.

Pearl, Downing, Red Jacket.

W. F. W. Fisher, Burlington.

Downing, Josselyn or Red Jacket.

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ESSEX PENINSULA

(Including Essex, Kent, and Pelee Island).

J. L. Hilborn, Leamington.

Pearl, Downing, Whitesmith.

LAKE HURON DISTRICT

(Including Counties of Huron and Bruce).

D. F. Hamlink, Goderich.

Pearl, Downing.

GEORGIAN BAY DISTRICT

(Including northern portions of the Counties of Grey and Simcoe, bordering on the Georgian Bay).

J. G. Mitchell, Clarksburg.

Houghton, Pearl, Downing, Red Jacket, Industry.

LAKE SIMCOE DISTRICT

(Including the northern and eastern section of Simcoe and northern sections of York and Ontario bordering on Lake Simcoe).

G. C. Caston, Craighurst.

Pearl, Downing.

GUELPH DISTRICT

(Including the high inland counties of southwestern Ontario, *i.e.*, Wellington, Waterloo, northwestern section of Perth, south part of Grey, Dufferin, and northwest section of Peel and Halton).

Prof. J. W. Crow, O.A.C., Guelph.

American: Pearl, Downing.
English: Whitesmith, Industry.

ST. LAWRENCE VALLEY DISTRICT

(Including the valley of the St. Lawrence river from Kingston to the eastern boundary of the Province).

Harold Jones, Maitland.

Golden Prolific, Downing.

OTTAWA DISTRICT

(Including the Ottawa Valley and the eastern portion of the Province not elsewhere enumerated, south of latitude 46 deg.).

W. T. Macoun, Horticulturist, Central Experimental Farm, Ottawa.

Pearl, Downing, and Red Jacket.

ALGOMA DISTRICT

(Including the islands of Manitoulin and St. Joseph and a limited portion of the northern and eastern shore of the Georgian Bay).

Chas. Young, Richard's Landing.

Golden Prolific, Pearl, Downing, Red Jacket, Champion.

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DESCRIPTION OF VARIETIES

CHAMPION.

A valuable variety for market in green condition.

ORIGIN: at Salem, Oregon.

PLANT: very vigorous; of easy cultivation; fairly productive.

BERRY: size about equal to that of Downing; form round oval; skin greenish yellow. thin, tender; flavor fair.

QUALITY: fair.

VALUE: market, second class.

SEASON: early.

CROWN BOB.

CROWN BOB.

A profitable gooseberry.

BUSH: inclined to overbear, and thus exhaust its vitality; drooping in habit.

BERRY: oblong, very large, especially if thinned before it is full grown; skin thin, hairy; color red; of very good flavor, but being an English variety is subject to mildew.

SEASON: early.

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DOWNING.

DOWNING (slightly reduced).

This has been the most popular gooseberry of American origin for some years, unless we except the Pearl, a variety of Canadian origin, very similar in size and appearance. It is very widely known and planted all over the continent of North America. It is not subject to mildew, and succeeds splendidly everywhere.

ORIGIN: by Chas. Downing, Newburgh, N.Y.; a seedling of Houghton.

PLANT: first rate in health and vigor and productiveness; an upright grower.

FRUIT: size medium; form round, often somewhat narrowed toward apex; skin smooth, transparent green with distinct light green ribs, and a thin whitish bloom.

FLESH: light green; tender, sweet and good.

VALUE: for market, first class.

SEASON: medium.

KEEPSAKE.

KEEPSAKE.

A very good commercial gooseberry, which succeeds in many parts of Ontario.

ORIGIN: England.

BUSH: vigorous; productive; very little subject to mildew.

BERRY: medium to large; form nearly round; color greenish white; skin smooth; flavor sweetish.

QUALITY: very good.

VALUE: market, first class.

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PEARL.

The Pearl gooseberry has been widely planted in the commercial gardens of Canada and the United States. It is certainly a magnificent cropper, but it is very difficult indeed to distinguish the berry from the Downing, except that it averages a trifle larger.

ORIGIN: London, Ontario, by Mr. Saunders; a cross between Houghton and Red Warrington.

PLANT: healthy, not subject to mildew; upright, spreading; first rate in vigor and in productiveness.

FRUIT: medium, round, often narrowing toward apex; skin smooth, transparent green, with thin whitish bloom and light green ribs.

FLESH: light green, tender, sweet and good.

VALUE: market, very much the same as Downing.

SEASON: medium.

PEARL.

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RED JACKET (*Josselyn*).

One of the best gooseberries for the Ontario fruit grower, either for home use of for market.

ORIGIN: at London, Ont., by Dr. Wm. Saunders.

PLANT: an excellent grower; free from mildew; almost equal to Pearl in productiveness.

BERRY: form round oval; color reddish green, shading into red; skin smooth and transparent, rather tender; texture juicy; flavor rich.

QUALITY: cooking, very good.

VALUE: market, first class.

SEASON: medium.

RED JACKET.

WHITESMITH.

One of the best of the English varieties for cultivation in Ontario; succeeds on clay land, with northern aspect. On the sandy soil of the Niagara district it is much affected by mildew.

ORIGIN: England.

PLANT: upright, fairly productive, fairly vigorous.

FRUIT: large, oval, downy, with distinct regular veins; green, and when ripe sweet and agreeable.

QUALITY: very good for home uses.

VALUE: first class for market.

SEASON: early.

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WHITESMITH.

INDUSTRY.

INDUSTRY (*Wyndhams*).

ORIGIN: England.

BUSH: hardy, vigorous; one of the freest from mildew of all English varieties.

FRUIT: round to oval; medium to very large; quality good to very good;

MARKET: excellent.

SEASON: early.

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THE RASPBERRY

The raspberry is the most popular bush fruit grown in Ontario, and as it follows the strawberry in season the consumer is well supplied with these two fruits most of the summer. The raspberry being a native of Ontario, is hardy in almost all parts of the Province, hence it is cultivated over a very wide area.

Like the other bush fruits, the raspberry does best when grown in a cool, moist, but well-drained soil. While this soil should be of good quality, if it is very rich in nitrogen the growth may be too rank and in some localities the canes on this account are more liable to winter injury. The best success is usually obtained with a sandy loam or loam, although the raspberry will do fairly well in most kinds of soil. The preparation of the land should be the same as for other bush fruits. The plants may be set either in fall or spring, although if young growing suckers are used they may be planted successfully any time in the early part of the summer where the soil is moist.

Red raspberries are usually planted in rows seven and one-half feet apart with the plants three feet apart in the rows, although they may be cultivated longer and better if grown in hills about five feet each way, and for the amateur this is the best way to grow them. The cultivation of the raspberry should be thorough to retain moisture, as in the fruiting season a good supply of moisture is very important. Some growers prefer pinching back the canes in summer when they are from eighteen inches to two feet in height, believing that they get a better crop by so doing, but this system is not recommended as it has been found by experiments that red raspberries succeed better when the growth is not headed back in summer. Sometimes, also, the pinching is delayed and the laterals which are made do not ripen thoroughly and the canes are injured by winter. It is best to let the canes make full growth in summer, and if they are very tall they may be headed back to three or four feet in height before growth begins in the spring.

Black raspberries are planted most successfully in the spring. They should be set rather shallow, as if planted deep they will not grow. Stockier plants will be obtained if the plants are set in a furrow and lightly covered with soil, applying more soil as the plants grow until the field is level. Pinching back in summer is a good practice with black raspberries, as it makes the plants stockier and better able to withstand storms.

The thinning out of the canes may be done in fall or spring. Seven or eight of the strong canes of red raspberries to a hill and three or four of black raspberries are sufficient to leave. If the raspberries are grown in a hedge row the weakest canes should be removed, leaving those which are to fruit about six inches apart. The raspberry plantation should be kept well supplied with plant food, but a too liberal use of nitrogenous fertilizers, as previously stated, should be avoided.

In the colder parts of the country it is a very good practice to bend the canes down in the fall for better protection in winter, the canes being held in place by covering the tips with soil. By adopting this plan serious winter injury rarely occurs.

VARIETIES RECOMMENDED.

General List, approved by the Board of Control.

Black: Hilborn, Older, Gregg, Smith Giant.
Purple: Columbian, Shaffer.
Red: Marlboro, Herbert, Cuthbert.
White: Golden Queen.

DISTRICT LISTS.

NIAGARA DISTRICT

(Including the Niagara Peninsula from the Niagara River to Hamilton and north to the escarpment).

S. H. Rittenhouse, Jordan Harbour.

Red: Marlboro, Cuthbert.
Black: Gregg.

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BURLINGTON-OAKVILLE DISTRICT

(Including the southern part of the counties bordering on Lake Ontario between Hamilton and Toronto).

A. W. Peart, Burlington.

Red: Marlboro, Herbert, Cuthbert.

ESSEX PENINSULA

(Including Essex, Kent, and Pelee Island).

J. L. Hilborn, Leamington.

Black: Kansas, Hilborn, Gregg.
Red: Marlboro, Cuthbert.
Yellow: Golden Queen.
Purple: Columbian.

LAKE HURON DISTRICT

(Including Counties of Huron and Bruce).

D. F. Hamlink, Goderich.

Black: Conrath, Hilborn.
Red: Marlboro, Herbert, Cuthbert.
White: Golden Queen.

GEORGIAN BAY DISTRICT

(Including northern portions of the Counties of Grey and Simcoe, bordering on the Georgian Bay).

J. G. Mitchell, Clarksburg.

Red: Marlboro, Herbert, Cuthbert.
Black: Hilborn, Older, Gregg.

GUELPH DISTRICT

(Including the high inland counties of southwestern Ontario, i.e., Wellington, Waterloo, northwestern section of Perth, south part of Grey, Dufferin, and northwest section of Peel and Halton).

Prof. J. W. Crow, O.A.C., Guelph.

Black: Older, Smith Giant.
Red: Marlboro, Herbert, Cuthbert.
Purple: Columbian.
White: Golden Queen.

OTTAWA DISTRICT

(Including the Ottawa Valley and the eastern portion of the Province not elsewhere enumerated, south of latitude 46 deg.).

W. T. Macoun, Horticulturist, Central Experimental Farm, Ottawa.

Black: Hilborn, Older, Cumberland.
Red: Marlboro, Herbert.
Yellow: Golden Queen.

ALGOMA DISTRICT

(Including the islands of Manitoulin and St. Joseph, and a limited portion of the northern and eastern shore of the Georgian Bay).

Chas. Young, Richard's Landing

Red: Marlboro, Louden.
White: Brinckle Orange (for quantity only).

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DESCRIPTION OF VARIETIES

CAROLINE.

A very productive variety, but of little use for market because too soft for shipping, and not in favor for home use because of its ordinary quality.

ORIGIN: at New Rochelle, N.Y., by S. P. Carpenter; supposed seedling of Brinckle's Orange.

FRUIT: medium size; form round; color pinkish yellow; seeds small, close, easily parted from each other and from stalk; flesh juicy, sweet, lacking in flavor.

QUALITY: only fair for all purposes.

VALUE: second class for market.

SEASON: early.

CONRATH.

CONRATH (slightly reduced).

One of the best blackcaps for profit.

ORIGIN: Michigan, in 1886; a chance seedling near Ann Arbor; introduced by Conrath Bros.

BUSH: vigorous, healthy, productive, resistant to drouth.

BERRY: large; firm; black.

QUALITY: good for either cooking or dessert.

VALUE: for market, very good.

SEASON: early.

ADAPTATION: succeeds well at our Lake Huron station. Highly recommended in Catalogue of American Pomological Society for Ontario, Michigan and New York.

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COLUMBIAN.

Valuable for cooking, canning and table use; but not popular in color as a market berry.

ORIGIN: a supposed seedling of Cuthbert, crossed with Gregg, at Oneida, N.Y.

PLANT: a strong, vigorous grower; very productive.

BERRY: size large; color purple; texture fairly firm, moderately juicy; flavor nearly sweet.

QUALITY: very good for cooking; fair for dessert.

VALUE: market, second class.

SEASON: medium.

CUTHBERT (*Queen of the Market*).

Previous to the introduction of the Cuthbert, many varieties of raspberries were grown for profit, such as Turner, Philadelphia, Highland Hardy, etc., but these have given place entirely and are heard of no longer. So prolific has this variety proved itself that acres have been planted by fruit growers throughout Ontario, and immense quantities of its fine fruit sent into our best markets. A favorite for canning factories.

ORIGIN: chance seedling in the garden of Thomas Cuthbert, Riverdale, N.Y.

PLANT: vigorous, canes strong, often six feet high or more on rich sandy loam, not too dry; sometimes branching; very productive; spines short, stout, numerous, suckers almost too freely and young growth needs to be kept within bounds.

FRUIT: large; color bright crimson; form conical, obtuse at apex; seeds small, compact, part easily from stalk when very ripe; flesh firm, fairly juicy, sweet, agreeable.

SEASON: medium.

QUALITY: very good for cooking; good for dessert.

VALUE: first class for market.

CUMBERLAND.

CUMBERLAND.

A promising black cap.

ORIGIN: by David Miller, Camp Hill, Pennsylvania, in 1896.

PLANT: vigorous; productive.

BERRY: size very large; form oval; color black; texture firm; flavor very pleasant.

QUALITY: dessert or cooking, very good.

VALUE: market, first class.

SEASON: early.

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COLUMBIAN.

CUTHBERT.

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GOLDEN QUEEN.

A good yellow variety; not grown for market, the red colored varieties being more in demand.

ORIGIN: New Jersey; a sport of the Cuthbert; 1883.

BUSH: vigorous; very productive; hardy.

BERRY: medium to large; roundish conical; color rich golden yellow; similar to Cuthbert except in color.

FLESH: tender; juicy; sweet.

QUALITY: dessert good; cooking good.

VALUE: market, second class.

SEASON: medium.

GOLDEN QUEEN.

KANSAS.

One of the newer black caps.
ORIGIN: chance seedling in Kansas, U.S., about 1884.
BUSH: vigorous; very thorny; propagation easy; tender in Lake Huron district.
BERRY: large; roundish; color shining black.
FLESH: firm; moderately juicy; flavor mild, pleasant.
QUALITY: very good for canning, pies, etc.
VALUE: market, first class.
SEASON: medium.

LOUDON.

A good market variety, the berries being a little larger than Cuthbert, but not quite equal to it in quality.

ORIGIN: raised by F. W. Loudon, of Wisconsin, from seed of Turner crossed with Cuthbert.

PLANT: hardy; very productive, but not very vigorous; canes very slightly branched, and have strong buds which produce the fruiting branches; pinching back the tips is, therefore, not wise.

BERRY: size large; form conical; color red, attractive; grains large, inclined to crumble; texture firm; flavor fair.

QUALITY: dessert or cooking fair.

VALUE: first for market.

SEASON: medium.

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GREGG.

GREGG.

One of the best late black caps for market purposes; an excellent shipper and also much valued for evaporating.

ORIGIN: on the Gregg farm, Ohio County, Indiana, in 1866.

PLANT: vigorous; fairly hardy; canes upright, clean and smooth, rather difficult of propagation; very productive.

BERRY: size large; color black with grey bloom; texture firm, moderately juicy; flavor sweet.

SEASON: late.

HERBERT.

A valuable red raspberry for the commercial plantation; combining the good qualities, hardiness, productiveness and earliness.

ORIGIN: a chance seedling in the garden of Mr. R. B. Whyte, Ottawa, about the year 1890; introduced by the Renfrew Nursery Company.

BUSH: hardy, enduring the cold winters at Ottawa with a temperature of 30 below zero; vigorous; about equal to Cuthbert; productive.

BERRY: large; color, bright red; form, somewhat oblong; texture, a little tender, juicy; flavor, sweet and excellent.

QUALITY: very good for all purposes.

VALUE: market, first class.

SEASON: earlier than Cuthbert.

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HERBERT.

HILBORN.

Digitized by Google

HILBORN.

A favorite black cap for market in some localities.

ORIGIN: a chance seedling, introduced by W. W. Hilborn, of Leamington, Ontario, in 1886.

BUSH: hardy; vigorous; productive.

FRUIT: medium to large, about the size of Gregg; color black; texture firm, juicy; flavor rich and good.

QUALITY: first class for dessert or cooking.

VALUE: market, first class.

SEASON: early.

MARLBORO.

This raspberry has been coming gradually to the front ever since its introduction about the year 1880. The old Highland Hardy for a while disputed its place as an early market berry, but the superior size and beauty of the former soon caused the latter to give place entirely, until Marlboro and Cuthbert have been for many years the two leading varieties of red raspberries to cover the season. The Marlboro thrives best on a heavier soil than that suited to the Cuthbert, and a little drier and heavier subsoil.

PLANT: fairly vigorous; canes short, stout, upright, without branches; propagated by suckers; fairly productive.

BERRY: round; color light red; seeds close and firm; flavor mild, pleasant; texture rather seedy.

QUALITY: fairly good.

VALUE: market, first class.

SEASON: early.

MARLBORO.

MILLER.

A promising berry for near markets.

ORIGIN: found near Wilmington, Delaware.

PLANT: strong; vigorous; hardy; productive.

BERRY: medium; color bright red; texture tender; flavor sweet, pleasant.

QUALITY: very good.

SEASON: early.

PHŒNIX.

Considered a profitable market variety for some growers, but by others reported as only moderate productive.

ORIGIN: United States.

BUSH: fairly vigorous; hardy; not very productive.

BERRY: large; red.

QUALITY: very good.

SEASON: medium.

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OLDER.

A popular black cap in Iowa; counted a failure in Michigan; reported upon favorably at the Lake Huron station.

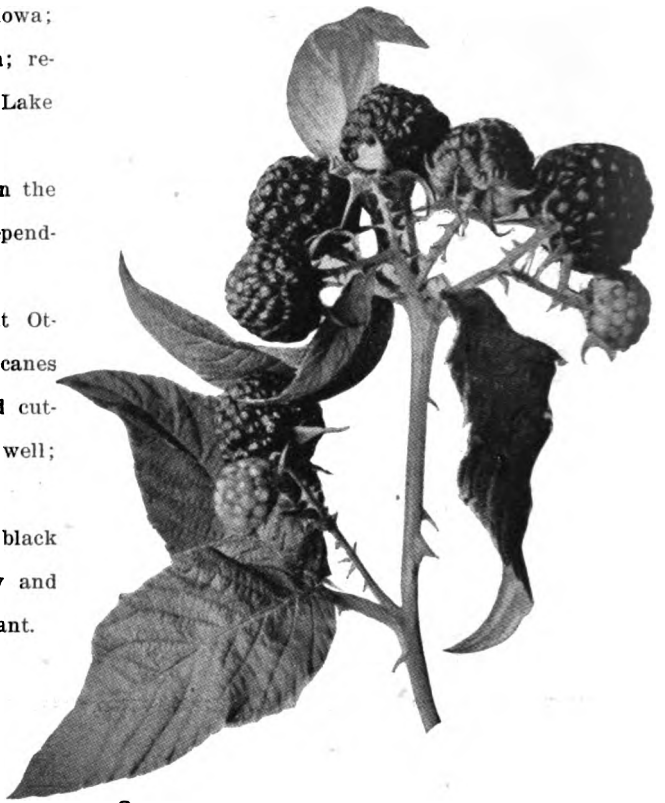
ORIGIN: a chance seedling in the garden of Mr. Older, of Independence, Iowa, in 1872.

PLANT: vigorous; hardy at Ottawa, Guelph, and Walkerton; canes of a trailing nature and need cutting back; endures drouth well; productive.

BERRY: large; color jet black without bloom; texture juicy and moderately firm; flavor pleasant.

QUALITY: good.

SEASON: early to medium.



OLDER.

RELIANCE.

A fairly good early table berry; rather soft for shipment; resembles Turner.
ORIGIN: New Jersey; a seedling of the Philadelphia raspberry.
BUSH: healthy; canes strong and vigorous; very productive.
BERRY: size medium; color dark red; texture inclined to be soft and juicy; flavor sweetish, ordinary.
QUALITY: dessert and cooking, fair.
VALUE: first class for near market; second class for shipping.
SEASON: early.

TURNER.

A fine table berry, and valuable for the home garden; a good market berry, but rather soft for distant shipment.
ORIGIN: by J. B. Turner, Jacksonville, Illinois.
PLANT: very hardy; fairly vigorous, making a good strong cane; productive.
BERRY: form roundish conical; size medium; color dark red; texture soft; flavor sweet, excellent.
QUALITY: dessert or cooking, very good.
VALUE: home market, first class; distant market, second class.
SEASON: medium.

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SHAFFER.

On its first introduction the Shaffer created much enthusiasm by reason of its thrift, productiveness and good quality. It is still considerably grown for canning purposes, but its color is not a favorite one in the market.

ORIGIN: on farm of Mr. Shaffer, Wheatland, N.Y., in 1869; introduced by Chas. Green, Rochester, in 1881.

SHAFFER.

PLANT: very vigorous; canes grow six or seven feet high, if not pinched back; very productive; propagates from tips.

FRUIT: large; color purple; form roundish; grains large, loose, easily separated from stalk; flesh very juicy and tender; flavor sweet, rich and very agreeable.

QUALITY: very good for cooking; good for dessert.

VALUE: second class for market.

SEASON: medium.

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SMITH GIANT.

A very promising black raspberry for the commercial plantation.

ORIGIN: with A. M. Smith, St. Catharines, Ont.

PLANT: vigorous, fairly hardy and quite productive.

FRUIT: very large; black, with heavy bloom.

QUALITY: dessert or cooking, very good.

VALUE: market, one of the best.

SEASON: late.

SMITH GIANT.

STRAWBERRY-RASPBERRY.

Considered somewhat valuable for canning, presenting an attractive appearance in the jar; interesting as a curiosity, but of no commercial value; may become a troublesome weed.

PLANT: easily propagated by suckers and rootstocks; scantily productive; stalks grow eighteen inches high and die down in the fall; fruits on growth of the current season.

BERRY: large; color a beautiful bright red; quality poor, but somewhat improved by cooking.

VALUE: market, third class.

SEASON: July to September.

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4. The Strawberry

The strawberry is the most popular fruit cultivated in Ontario. This is doubtless due in part to the intrinsic value of the strawberry itself, which is one of the most delicious of fruits, but it is believed that the popularity of the strawberry comes largely from the fact that it can be grown by almost every one, as, unlike most fruits, very little land is required to produce sufficient for home consumption.

Strawberries can be grown in all parts of Ontario where the soil is suitable, hence large quantities are produced and consumed annually, and owing to the difference in the time of ripening between the southern and northern parts of the Province, the season is lengthened very much, and furthermore, the strawberries of one district do not come in such close competition with those from another as they would do if all ripened at the same time.

Strawberries will succeed on almost any rich, well-drained soil, but the largest crops are, it is believed, produced on a deep, warm sandy loam, which is retentive of moisture. It is important, however, to avoid planting strawberries where water is likely to lie at any time, as surface water is very injurious to the plant, and if water freezes over strawberries in winter they are almost sure to be killed.

In preparing soil for this fruit, it should be made very rich. There are no records known where land was made too rich for strawberries. There is nothing so good as well-rotted manure for this purpose. Fresh manure is not so good, as it usually contains many weed seeds which will germinate after the manure is applied. The manure should be thoroughly worked into the surface soil early in the spring, for if this is not well done the soil will dry out, the conservation of moisture being important in growing strawberries. Strawberries also do well after clover, which in part takes the place of manure. The best time to set out the plants is early in the spring. Fall planting is not recommended, as although there is fair success in wet seasons, in a dry year the plants usually suffer.

When the ground has been marked off into rows about 3½ feet apart with cross rows about 18 to 20 inches apart, the plants are set at the intersections of the rows. The usual practice with large growers is for one person to open a hole with a spade, and another, preferably a boy, to place the plant, the soil being then pressed against the plant with the foot. In smaller plantations, planting with a trowel will be found very satisfactory. The chief essentials in planting are first to have the crown of the plant a little below the surface of the soil when it is pressed down. If the crown comes above the surface of the soil the plant is almost sure to die from drying out, and set too deep the plant is liable to rot. The second important point is to make the soil firm about the plant, thus causing the moisture to rise to the roots. Strawberry plants are almost sure to die, especially in a dry time, if this precaution is not taken. A third essential, is to spread the roots in the cleft made by the spade, as although the plants will live even if this is not done, they will start quicker and thrive better if the roots are properly spread. After the plants are set cultivation should be thorough to conserve moisture and encourage the production of young plants early in the season, as the earlier these young plants are produced and become rooted, the larger crop they are likely to bear the next season.

All flowers should be pinched off the first season, as they exhaust the strength of the plant and delay the production of runners. The most common method of growing strawberries is in the matted row. Grown in this way there should be a row of plants about two feet in width by autumn. During the summer, as runners are made, they should be placed about six inches apart and held with a little soil so as to give the plants the best chance to develop. After a row of the required width has been formed, later plants should, if possible, be cut out by hand and with the cultivator, so that the rows will not become too crowded nor too wide. A full crop should be obtained the second season. Hill culture and narrow rows are recommended in some quarters, but while finer fruit is obtained than by the matted row system, more labor is involved.

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It is advisable to cover the strawberries lightly with straw after the ground freezes, to prevent the alternate thawing and freezing of the ground in winter and early spring. This covering should be removed in the spring before growth begins.

To get the best results only one crop should be taken from a strawberry plantation. If the land is very clean and the varieties used do not run much, two crops can be removed with profit. As a rule, however, the labor involved in destroying weeds, and the deterioration in size of fruit, makes it more profitable to plough up the plantation after the first crop.

It should be thoroughly understood by those intending to plant strawberries that some varieties have imperfect flowers and will not produce fruit unless a perfect flowering sort is planted near to pollenize the imperfect flowers. One row of the perfect variety to three of an imperfect is usually sufficient. There are many new varieties of strawberries introduced every year, but few of these are better or even as good as those already on the market. However, the old kinds are constantly giving place to the new, and it is wise for the fruit grower to learn which new varieties are giving the best results. Many varieties are described in this report, but it will be found that but few are recommended.

Varieties Recommended.

General List, approved by the Board of Control.

Commercial: Bederwood (P.), Splendid (P.), Warfield (Imp.), not suited to light sandy soil, Greenville (Imp.), Williams (Imp.), Saunders (P.), Sample (Imp.), Irene (Imp.), Buster (Imp.), Parsons Beauty (P.).

Note.—These varieties vary somewhat in order of their ripening season. In selecting varieties for planting, perfect-flowered varieties should be included to fertilize those having imperfect flowers.

DISTRICT LISTS.

Niagara District

(Including the Niagara Peninsula from the Niagara River to Hamilton and north to the escarpment).

Robert Thompson, St. Catharines.

Williams and Brandywine for long distance shipment.

S. H. Rittenhouse, Jordan Harbor.

Dunlap, Ozark, Sample, Williams, Stevens.

Fonthill District

(Including Townships of Pelham, Stamford and Thorold).

G. C. Brown, Fonthill.

Lovett, Williams, Sample, Parsons.

Burlington-Oakville District

(Including the southern part of the counties bordering on Lake Ontario between Hamilton and Toronto).

A. W. Peart, Burlington.

Bederwood, Dunlap, Williams, Gibson, Glen Mary, Leader.

W. F. W. Fisher, Burlington.

Dunlap, Gibson, Haverland, Bubach, Glen Mary, Williams.

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Brant District

(Including Counties of Brant, Oxford, Middlesex and southwestern part of Perth).

J. C. Harris, Ingersoll.

Warfield, Dunlap, Bederwood, Haverland, Williams, Sample, Enhance.

Lake Erie District

(Including approximately the Counties of Haldimand, Norfolk, Elgin, Welland, excluding Fonthill District).

Jas. E. Johnson, Simcoe.

Warfield, Dunlap, Splendid, Sample, Enhance.

Guelph District

(Including the high inland counties of southwestern Ontario, *i.e.*, Wellington, Waterloo, northwestern section of Perth, south part of Grey, Dufferin, and northwest section of Peel and Halton).

Prof. J. W. Crow, O.A.C., Guelph.

Bederwood (P.), Splendid (P.), Warfield (Imp.), Williams (P.), Parsons (P.).

St. Lawrence Valley District

(Including the valley of the St. Lawrence River from Kingston to the eastern boundary of the Province).

Harold Jones, Maitland.

Belt, Williams, Wolverton, Climax, Saunders, Miller.

Ottawa District

(Including the Ottawa Valley and the eastern portion of the Province not elsewhere enumerated, south of latitude 46 deg.).

W. T. Macoun, Horticulturist, Central Experimental Farm, Ottawa.

Bederwood (P.), Splendid (P.), Warfield (Imp.), not suited to light soil; Greenville (Imp.), Parsons Beauty (P.), Pocomoke (P.), Sample (Imp.), Buster (Imp.).

Algoma District

(Including the islands of Manitoulin and St. Joseph, and a limited portion of the northern and eastern shore of the Georgian Bay).

Chas. Young, Richard's Landing.

Clyde, Haverland, Glen Mary, Brandywine.

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DESCRIPTION OF VARIETIES

ANNIE LAURIE.

This is a very late variety, also one of the best quality. It may be taken as a standard for quality and flavor.

ORIGIN: a seedling grown by John F. Beaver, of Ohio, in 1889.

PLANT: very healthy and a good grower, making plenty of runners for a fruiting row. No rust; perfect blossom; moderately productive.

FRUIT: berries are large and round, like the Jersey Queen, with gold seeds prominent. A very bright glossy scarlet, making a fine appearance.

FLESH: pinkish white, of the very finest quality; a fine table variety.

SEASON: late.

BEDERWOOD.

One of the most productive of the early varieties.

ORIGIN: with Bederwood, of Illinois.

PLANT: vigorous; inclined to rust; very productive. Stevenson ranks it "as the standard of productiveness for early varieties," blossom perfect, an excellent pollenizer.

BERRY: size small; form roundish; color light vermilion.

FLESH: texture soft; flavor sweet, ordinary.

QUALITY: dessert, poor; canning, fair.

VALUE: near market, first class; distant, second class.

SEASON: early.

BELT.

ORIGIN: this berry comes from Ohio, having been originated by Wm. Belt, of that State. It is being grown largely as a fancy berry.

PLANT: large and strong, but rusts sometimes very badly; perfect blossom; quite productive.

BELT.

FRUIT: large to very large, conical; bright scarlet in color; firm.

FLESH: pink slashed with white; nice mild flavor; best quality.

SEASON: medium to late.

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BRANDYWINE.

Highly valued in some sections.

ORIGIN: seedling of Glendale x Cumberland, raised by E. Ingram, of Pennsylvania; introduced in 1894.

PLANT: very vigorous; propagates almost too freely; perfect flowered; productive.

BERRY: large; form oblate conical; color crimson.

FLESH: texture firm; flavor aggreeable acid.

QUALITY: dessert, very good.

VALUE: market, first class.

SEASON: medium to late.

BISMARCK.

A good mid-season market berry; in some respects an improvement on its parent.

ORIGIN: grown from seed of Bubach fertilized by Bubach, by I. C. Baure, of Arkansas.

PLANT: vigorous; healthy; easily propagated; perfect flower; very productive.

BERRY: large; roundish conical; color crimson; seeds yellow.

FLESH: color pinkish; texture firm; flavor sweet.

QUALITY: dessert, very good.

VALUE: market, first class.

SEASON: mid-season to late.

BOYNTON.

This variety so closely resembles the old Crescent in its best days that it has been affirmed by some that it is the Crescent under a new name.

ORIGIN: said to be a cross between the Crescent and Sharpless; from Albany, N.Y.

PLANT: strong, vigorous, and healthy grower, making a wild, matted row; imperfect blossom; very productive.

FRUIT: medium in size; light scarlet in color; medium in firmness.

FLESH: pink; acid, but fair quality.

SEASON: early, medium.

BUBACH.

BUBACH.

A standard market berry, of the largest size.

ORIGIN: a seedling raised by J. G. Bubach, of Illinois.

PLANT: healthy; vigorous; does not make many runners; imperfect blossom; only fairly productive.

BERRY: very large; conical; irregular; color scarlet; showy.

FLESH: red, agreeable and acid.

QUALITY: dessert, good.

VALUE: near market, first class; one of the best.

SEASON: medium.

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BUSTER.

A valuable late variety, which seems to adapt itself well to varied conditions. In the extensive variety tests both at the Central Experimental Farm, Ottawa, and at the Ontario Agricultural College, Guelph, it has for years ranked among the most productive sorts.

ORIGIN: supposed to be seedling of Bubach, raised by Mr. Stone, of Illinois.

PLANT: extra large, with very long, stout stalks and healthy foliage, remarkably free of rust; propagates readily and usually makes a good wide row of plants. Blooms late and flowers are imperfect, requiring a late blooming perfect flowered variety, such as Williams, to insure fertilization. Very productive.

BUSTER.

FRUIT: very large and well formed, quite regular in shape. Like Clyde, it is rather pale in color for a first-class berry. This is its most objectionable feature. Seeds deeply pitted. Moderately firm for so large a berry; fair quality, somewhat acid.

SEASON: among the latest.

ADAPTATION: seems to adapt itself well to varied conditions and is favorably reported upon from many sources. (*Hutt.*)

CLYDE.

At one time a universal favorite as a commercial berry, but has not held up its early records.

ORIGIN: seedling of Cyclone about 1890, by Dr. Stayman, of Kansas; the Cyclone itself being a seedling of Crescent.

PLANT: very healthy, but wilts down under a hot sun; easy of propagation; perfect flowered.

BERRY: very large; form roundish conical; color light scarlet.

FLESH: moderately firm; color pinkish white; flavor very pleasant.

QUALITY: dessert, very good; canning, poor.

VALUE: second class for near market.

SEASON: early to medium.

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CARRIE.

The Carrie would appear to have a bright future before it. It is one of the late sorts bidding for public favor.

CARRIE.

ORIGIN: seedling of Haverland, by Mr. Thompson, of Virginia.

PLANT: large, vigorous and healthy, making long and strong runners and plenty of them; it somewhat resembles Haverland; not so productive; imperfect blossom.

FRUIT: the fruit is not so long as Haverland; very firm; color bright scarlet, with gold seeds.

FLESH: white and solid; good flavor.

SEASON: medium.

DUNLAP (*Senator Dunlap*).

A fine mid-season market berry, said to be better in quality and a better shipper than its parent.

ORIGIN: Ohio; a seedling of Warfield.

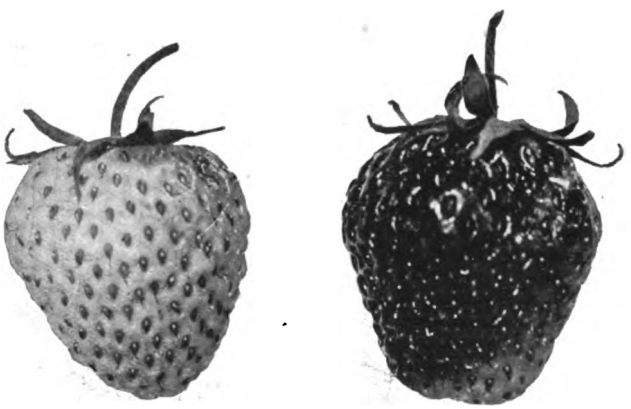
PLANT: small; vigorous, resistant of drouth; very productive; blossoms perfect.

BERRY: size medium to large; form long conical with short neck; color dark crimson.

FLESH: color red; texture firm.

QUALITY: very good.

VALUE: market, first class.



DUNLAP.

ELEANOR.

The Eleanor is one of the extra early kind; a good healthy vigorous grower; fruit good size, fine shape; in wet seasons it has a kind of mildew like on the Michel's.

ORIGIN: New Jersey, a chance seedling found by Mr. Coombe.

PLANT: very healthy, vigorous grower, small and slender, dark in color, making many runners; perfect blossom; quite productive.

FRUIT: color dark scarlet or crimson; medium in firmness.

FLESH: red, white centre; acid, but good flavor.

SEASON: one of the earliest.

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EMPEROR.

ORIGIN: by John Little, Granton, Ont.
PLANT: large, vigorous, healthy; quite productive; perfect flowered.
BERRY: very large; conical, sometimes ribbed; color dark red.
FLESH: reddish pink almost to the centre; texture firm.
QUALITY: good.
SEASON: medium to late.

EMPRESS.

Very like the Emperor and from the same source, originated by the late John Little. The plant is very healthy, strong, productive and a vigorous grower. The fruit is dark red and attractive, and of good quality; season, medium to late; blossoms perfect.

EXCELSIOR.

Popular in some sections because very early.
ORIGIN: Arkansas.
PLANT: vigorous; propagates easily; sometimes inclined to leaf rust; fairly productive; blossom perfect.
BERRY: medium; form roundish, somewhat conical; color bright red.
FLESH: texture firm; flavor very pleasant.
QUALITY: very good.
VALUE: market, second class.
SEASON: very early.

GEISLER.

ORIGIN: a chance seedling found in Michigan, somewhat resembling the Seaford in shape and size.
PLANT: a very strong plant, making plenty of runners; very healthy, no sign of rust and quite productive; perfect blossom; a very early bloomer, one of the first.
FRUIT: large, bright dark scarlet, round to oblong in shape; solid.
FLESH: light pink in color, medium in firmness and of good quality.
SEASON: early to medium.

GANDY.

One of the best very late varieties.
ORIGIN: New Jersey; seedling of Jersey Queen x Glendale.
PLANT: healthy; blossoms perfect; a shy bearer.
BERRY: large; form conical, regular; color glossy crimson.
FLESH: color pink; texture firm.
QUALITY: dessert, very good; canning, excellent.
VALUE: market near or distant, first class; an excellent shipping berry.
SEASON: very late.

GLEN MARY.

Considerably planted for market purposes on account of its size and productiveness.
ORIGIN: a chance seedling found by J. A. Ingram, of Pennsylvania.
PLANT: vigorous; healthy; foliage dark green; propagates readily; blossoms perfect; fruit stem stout; productive.
BERRY: large to very large; form round conical, ribbed, with green tip; color dark crimson.
FLESH: pink and white; texture firm; flavor slightly acid.
QUALITY: dessert, fair; canning, good.
VALUE: market, first class; a good shipper.
SEASON: medium to late.

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GREENVILLE.

A good commercial berry, which seems to succeed everywhere.

GREENVILLE.

ORIGIN: a chance seedling of Bubach found in Ohio.

PLANT: vigorous; healthy; propagation easy; blossoms imperfect; very productive.

BERRY: large but not quite as large as Bubach; form obtuse conical, approaching heart shape; color scarlet.

FLESH: pink to white; somewhat hollow; texture moderately firm; flavor pleasant.

QUALITY: very good.

VALUE: first class, especially for near market.

SEASON: medium.

HALES 11.59 P.M. (*Midnight*).

ORIGIN: seed from Haverland crossed with Parker-Earle; introduced by J. H. Hale, of Connecticut.

PLANT: strong and healthy, does not resemble either parent; makes plants only sparingly, but makes a good fruiting row; the runners are strong, fairly productive, and very late; blossom, perfect.

FRUIT: the berry is medium in size, flat and conical; color, light, almost white on under side; texture firm; flavor fine.

FLESH: pinkish, meaty, good eating.

HAVERLAND.

A good market variety, which succeeds everywhere; widely grown; the berries are a little soft for shipment.

ORIGIN: with a Mr. Haverland, of Ohio.

PLANT: very vigorous; very healthy; foliage light in color; fruit stalk long and not always able to support the load of fruit; blossoms imperfect; very productive.

BERRY: size large; form long, conical; color bright scarlet.

FLESH: pinkish; texture soft; flavor sweet.

QUALITY: dessert, fair; canning, fair.

VALUE: near market, first class; distant market, second class.

SEASON: early.

HOWARD'S No. 4.

A seedling originated by Mr. A. B. Howard, of Massachusetts.

PLANT: a strong, healthy good grower, very productive.

BERRY: large, conical, very regular; bright dark scarlet; large, and of great beauty.

QUALITY: very good.

SEASON: medium to late.

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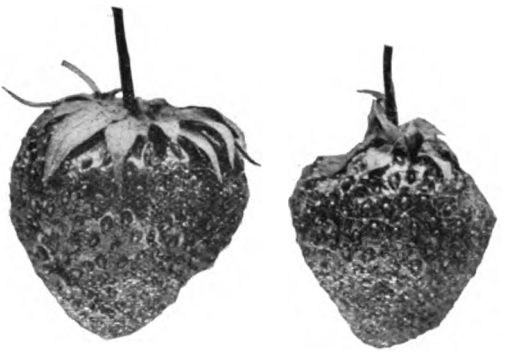
IRENE.

A good late variety, well worthy of a place in any collection for home use or market. Has been under test at the Ontario Agricultural College, Guelph, for several years, and ranks among the first half dozen for productiveness and general market value. An excellent canning variety because of its rich, dark color.



IRENE.

PLANT: not large, but very vigorous and healthy; makes plenty of runners; blooms late, and is imperfect flowered, requiring a late blooming pollenizer to insure good fertilization; very productive.

FRUIT: medium size; good shape; very smooth and regular; rich, dark crimson in color, with bright yellow seeds and varnished appearance; very attractive; firm, and good shipper; brisk acid; fairly good quality.

SEASON: medium to late, has a long season of fruiting.

ADAPTATION: adapts itself well to varied soils, and has been reported upon favorably by experimenters all over the Province to whom it has been sent for co-operative testing. Has not done so well at Ottawa as at Guelph. (*Hutt.*)

KLONDIKE.

A good late variety.

ORIGIN: Massachusetts.

PLANT: vigorous; somewhat subject to rust; easily propagated; quite productive.

BERRY: size large; form roundish conical, somewhat irregular; color scarlet; large low seeds.

FLESH: pink; moderately firm.

QUALITY: fair.

LOVETT.

A popular main crop strawberry; by some growers preferred to either Williams or Saunders.

ORIGIN: Crescent x Wilson, by J. H. Norris, of Kentucky.

PLANT: vigorous; foliage somewhat subject to rust; fruit stalks short and drooping; perfect flowered; productive.

BERRY: large; form round, conical; color dark red.

FLESH: color reddish; texture firm; flavor pleasant subacid.

QUALITY: dessert, good; canning, very good.

VALUE: near or distant market, first class.

SEASON: medium.

LUTHER (*August Luther*).

One of the extra early varieties; endures drouth well; succeeds generally.

PLANT: small; good grower; healthy; perfect in flower; fairly productive.

BERRY: medium; roundish conical, sometimes necked; color scarlet, with yellow seeds; texture moderately firm.

QUALITY: good.

VALUE: first class for early market.

SEASON: early; ripens with Michel.

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LOVETT.

MARGARET.

ORIGIN: Ohio, from the seed of the Crawford, by Mr. Beaver.

PLANT: large and strong, sending out the largest runners of any sort; very healthy; perfect blossom; quite productive.

FRUIT: large, very regular, crimson in color; seeds golden, solid and firm.

FLESH: red; inclined to tartness, but of good quality.

SEASON: medium.

MASTODON.

This is very like Bubach, both in plant and fruit, and quite as good.

ORIGIN: introduced by James Lippincott, Jr., Mount Holly, N.J.

PLANT: strong, large dark foliage; very healthy; makes plants freely enough for a good fruiting row; imperfect blossom; fruit stalk is short, thick and strong.

FRUIT: very large; bright crimson and very showy.

FLESH: pink; medium as to firmness and good quality.

SEASON: medium.

MASTODON.

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MARSHALL.

This variety has, perhaps, received more favorable notice than most others of recent introduction. It is vigorous in growth, leaves very large and produces very large, beautiful, dark crimson berries of fine quality.

MARSHALL.

ORIGIN: a chance seedling found growing on a stone heap by Mr. Ewell, of Massachusetts.

PLANT: a vigorous grower, large leaves, somewhat tender both in foliage and blossom and subject to rust; medium in color, first growth being yellow; perfect blossom; fruit stem strong and able to bear up the immense berries; medium in productiveness.

FRUIT: of the largest size; dark crimson, firm and fine looking, quite regular in shape, *i.e.*, each berry is of same shape, but ribbed and tough; seed imbedded.

FLESH: red, with a dash of white in centre, solid, fine quality; one of the best for dessert.

SEASON: early to medium.

ADAPTATION: does its best only on good soils and under highest cultivation; a fine one for amateurs.

MICHEL.

A favorite very early berry with some growers; a comparative failure with others; widely planted in Ontario.

ORIGIN: chance seedling of Crescent, found by J. S. Michel, Judsonia, Arkansas.

PLANT: vigorous; propagation rapid; fairly productive on some soils, on others not productive; foliage light colored; perfect flowered.

BERRY: size small to medium; form round conical; color dull red, withered appearance.

FLESH: pinkish; texture tough; carries well.

QUALITY: good.

SEASON; extra early.

MONITOR.

The Monitor originated from a chance seed in the orchard of L. T. Russell, Missouri, on ground where formerly Crescent and Capt. Jack grew. It has some of the qualities of both parents, the productiveness of the Crescent and the vigorous foliage of Capt. Jack.

PLANT: vigorous and healthy; foliage very dark green, glossy. The plant is small and makes almost too many runners; stands dry weather well and is very productive, blossom perfect.

FRUIT: the berry is large, roundish in form, and bright scarlet. The vigor of the plant seems to be such that it is able to mature and ripen its immense crop, there being no small berries.

FLESH: firm and good flavor; pinkish inside.

SEASON: early to late.

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NETTIE.

ORIGIN: one of Black's pedigree seedlings; it is a strong competitor of Hunn for extreme lateness.

PLANT: of medium size; quite healthy and a good runner, making plants freely; fairly productive; blossom imperfect.

FRUIT: large, ribbed, rough, of quite light color; seeds dark; flavor sour, but good; texture fairly firm.

FLESH: light colored, almost white.

NICK OHMER.

A good medium to late variety, of excellent quality.

ORIGIN: seedling raised by John F. Beaver, of Ohio.

PLANT: vigorous, stocky; propagation easy; healthy; foliage dark; perfect flowered.

BERRY: large, with some small ones; form roundish conical, smooth and regular; color glossy red with yellow seeds.

FLESH: pinkish toward outside and white at centre; texture very firm; flavor very pleasant.

QUALITY: very good.

VALUE: first to second class.

SEASON: medium to late.

PARSON'S BEAUTY.

Introduced in 1899. Originated in Maryland about 1891.

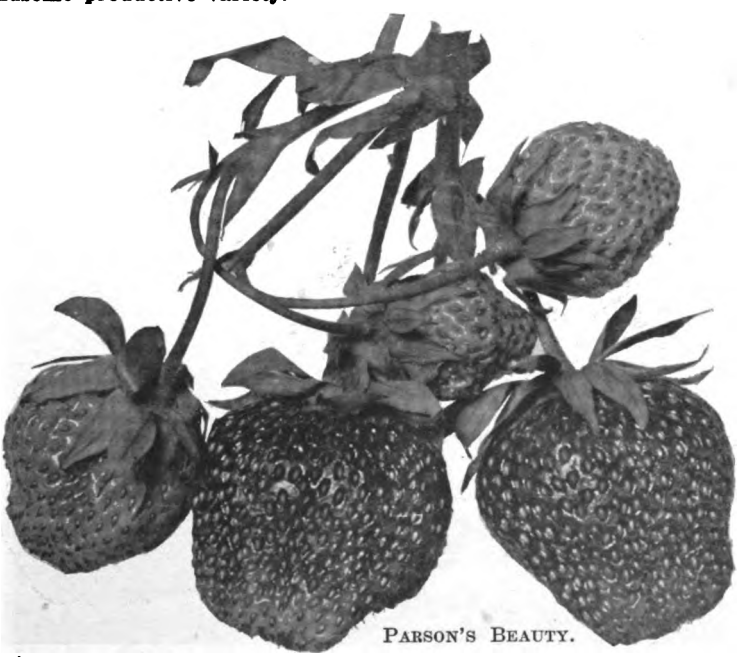
PLANT: vigorous, large number of runners; foliage moderately good, rusts slightly to considerably.

FRUIT: obtusely conical, above medium to large in size; bright red, glossy, prominent seeds.

FLESH: bright red, juicy, tender, subacid, firm; above medium quality.

SEASON: medium late.

A handsome productive variety.



PARSON'S BEAUTY.

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ROBBIE.

ORIGIN: one of J. H. Black's pedigree seedlings, from New Jersey.

PLANT: good grower, perhaps not as large as the Nettie or Joe, but healthy and free from disease; fairly productive; blossom perfect.

FRUIT: good size; conical in shape; light red; good flavor; quite pleasant, though peculiar to the taste.

FLESH: salmon-colored.

SEASON: late.

RIDGEWAY.

The Ridgeway is a good medium to late berry. It somewhat resembles the old Cumberland, but is darker.

ORIGIN: a seedling of Jersey Queen and Parker Earle, by Mr. Ridgeway, of Indiana.

PLANT: strong and healthy, stools out, would be good one for hills or narrow rows; foliage free from rust; blossom perfect and large; quite productive.

BERRY: medium to large; highest scarlet color; prominent golden seeds, fine looking; medium in firmness.

FLESH: red, solid and very good quality; fine flavored.

SEASON: medium to late.

RUBY.

A good standard variety, which adapts itself well to various soils and localities.

ORIGIN: a chance seedling with Mr. Riehl, of Illinois.

PLANT: a strong, vigorous grower, makes plenty of runners; blooms about mid-season; is perfect flowered and a good pollenizer; very productive.

BERRY: large, regular in shape; a good dark crimson color; firm and of good quality.

SEASON: mid-season.

ADAPTATION: does well at Guelph, and is favorably reported upon from other sections. (*Hutt.*)

RUBY.

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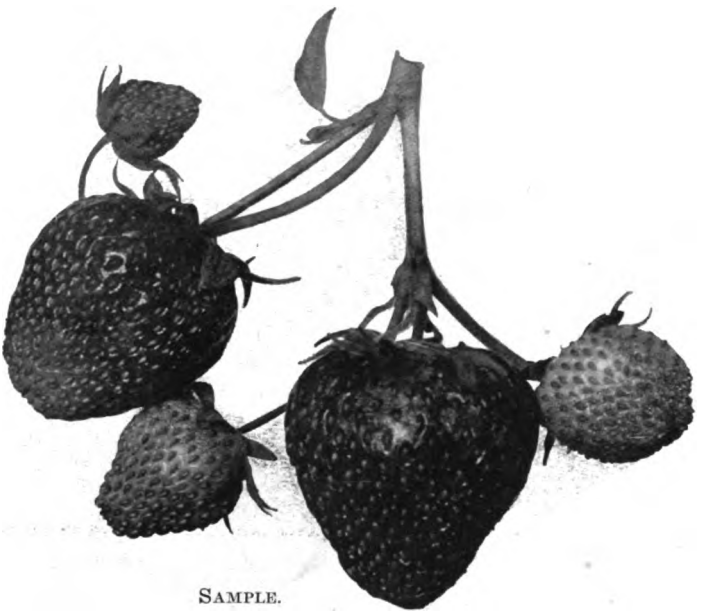
SAMPLE.

A profitable late market berry.
ORIGIN: Massachusetts.
PLANT: vigorous; healthy; productive; flowers imperfect.
BERRY: size large; form roundish conical; color crimson.
FLESH: tinted; texture fairly firm, juicy.
QUALITY: fair.
VALUE: market, first class.
SEASON: very late.



SAMPLE.

SAUNDERS.

SAUNDERS.

A first-class sort for medium to late market.

ORIGIN: a seedling raised by John Little, Granton, Ont., and named by him in honor of Dr. Wm. Saunders, of Ottawa.

PLANT: healthy, very little rust; very vigorous; very productive; blossom perfect; blooms late and so escapes the spring frosts; propagates easily.

BERRY: size large; form roundish conical; color glossy crimson.

FLESH: red; texture firm; flavor very pleasant.

QUALITY: dessert or cooking, very good.

VALUE: near or distant market, first class.

SEASON: medium to late.

SEAFORD.

The Seaford is a good, medium season berry.
ORIGIN: a chance seedling, introduced by Claymaker & Son, of Dover, Del.
PLANT: a strong, vigorous grower and healthy, producing large clusters of fine fruit; makes many plants; perfect blossom; very productive.
BERRY: large and fine looking; bright crimson with gold seeds imbedded; very solid and firm.
FLESH: scarlet in color; very firm and of very good quality.
SEASON: early to medium.

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SHARPLESS.

The Sharpless has been before the public for a long time. In some parts it is still said to be one of the best, but in other places it is not productive enough to make it profitable for market.

ORIGIN: Pennsylvania.

PLANT: a strong, vigorous grower; large and healthy; no rust; perfect blossom; quite productive on some soils.

FRUIT: very large; light scarlet in color; glossy, gold seeds prominent, does not color well.

FLESH: white to pink; firm and very best quality; fine for the table.

SEASON: medium.

SMITH.

Very popular for canning, having the agreeable acid and firm flesh of its parent.

ORIGIN: a seedling of that old favorite, the Wilson's Albany, raised by L. Smith, of Wisconsin.

PLANT: healthy; most vigorous; blossom perfect; very productive.

BERRY: medium to large; roundish conical; irregular; color scarlet.

FLESH: texture firm; quite acid; agreeable.

QUALITY: canning or preserving, best.

VALUE: market, first class.

SEASON: early.

SPLENDID.

A first-class early to mid-season market berry.

ORIGIN: by C. H. Sumner, Illinois.

PLANT: very healthy; a good strong grower; productive; blossom perfect, a good pollenizer.

BERRY: medium to large; form roundish; color dark crimson.

FLESH: firm; flavor good.

QUALITY: dessert, very good.

VALUE: market first class.

SEASON: early to medium.

SPLENDID.

STAPLES.

ORIGIN: from seed of the Warfield, by the late Mr. Staples, of Ohio.

PLANT: quite healthy, making plenty of runners for a wide row, if needed; quite vigorous in growth; perfect blossom; a good early bloomer to fertilize early pistillates with.

BERRY: dark crimson in color, firm and good flavor; color very like Warfield: size medium to large for so early a berry.

FLESH: pink and solid; good flavor, somewhat acid, yet spicy.

SEASON: extra early.

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TENNESSEE (*Tennessee Prolific*).

A very fine market berry, which has become popular wherever grown.
ORIGIN: Crescent x Sharpless, raised by Captain Hodges, of East Tennessee.
PLANT: healthy; vigorous; very productive; easily propagated; blossom perfect; blooms early.
BERRY: large; form round conical, sometimes double at the point; color bright crimson.
FLESH: color red; texture firm; flavor agreeable.
QUALITY: good.
VALUE: first class for near or distant market.
SEASON: medium.

TIMBRELL.

A fairly good late variety.
ORIGIN: chance seedling found by H. S. Timbrell, of New York State.
PLANT: healthy; vigorous; blossoms perfect; not very productive.
BERRY: size medium to large; form roundish conical; color crimson, but does not color well.
FLESH: texture very firm; flavor agreeable.
QUALITY: dessert, best.
VALUE: market, second class.
SEASON: late.

VAN DEMAN.

One of the earliest; a favorite with some growers, but not a success everywhere.

ORIGIN: Crescent x Captain Jack; raised by J. C. Bauer. of Judsonia, Arkansas.
PLANT: vigorous; productive; rusting slightly on some soils; foliage dark; fruit stalk strong enough to support the fruit; blossoms perfect.
BERRY: medium; form round conical; color dark crimson; seeds yellow, with a varnished appearance; ripens and colors all over at the same time.
FLESH: color pink; texture firm, a good shipper; flavor good.
QUALITY: dessert, very good.
VALUE: first class for market because of its season.
SEASON: very early.

VAN DEMAN.

WARFIELD.

With the housekeeper it is a favorite canning variety because of its dark rich color. It is one of the most desirable varieties for general cultivation, where the soil is not too light and dry for its growth.
ORIGIN: a chance seedling, supposed to be a cross between Crescent and Wilson, found by B. C. Warfield, of Southern Illinois.
PLANT: small, but a rampant grower, and often makes too many runners, filling the rows too thickly. Succeeds best on moist soils, and in showery seasons; often proves a failure on very dry soils or in times of drouth. Blossoms early and requires an early blooming bisexual variety, such as Splendid or Van Deman, to fertilize its blossoms; very productive.
BERRY: medium size, very regular in shape, dark rich crimson color; firm, good shipper, and excellent for canning; somewhat acid, but good quality.
SEASON: early to mid-season, holds out well if season is favorable.
ADAPTATION: does well wherever the soil is not too light and dry. (*Hutt.*)

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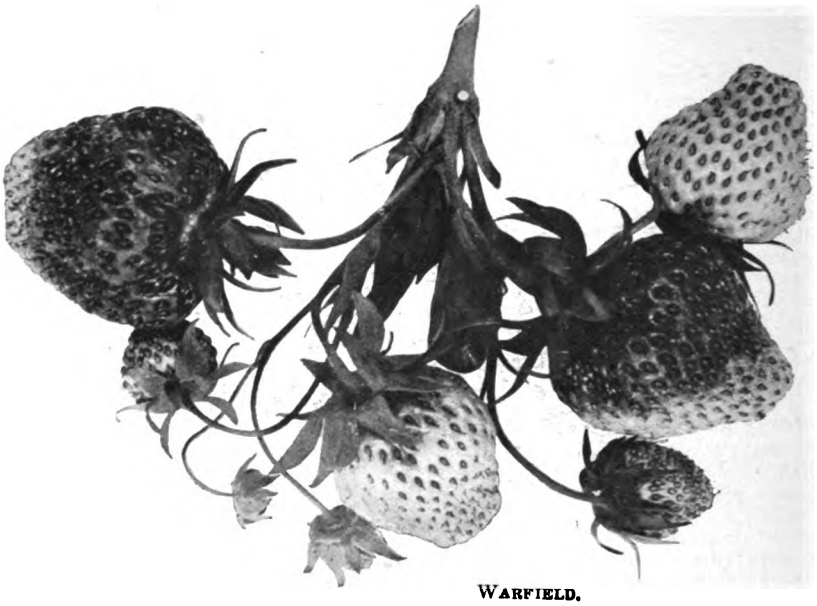

WARFIELD.

WILLIAMS.

Widely grown in Ontario in place of the old favorite Wilson; preferred by some growers to all others.

ORIGIN: a seedling of Sharpless, raised by Mr. Williams, of Burford, Ontario.

PLANT: vigorous; somewhat inclined to rust, runners abundant, short; blossom perfect; very productive.

BERRY: large, form roundish conical; seeds sunken; color crimson, usually with a white tip.

FLESH: red; often hollow; texture firm.

QUALITY: fair.

VALUE: market, first class.

SEASON: medium to late.

WILLIAMS.

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NOTE.—Names printed in *Italics* are synonyms of varieties otherwise named.

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NINTH ANNUAL REPORT

OF THE

ONTARIO

Vegetable Growers' Association

1913

(PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE)

PRINTED BY ORDER OF

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1914

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To His Honour SIR JOHN MORISON GIBSON, Knight Commander of the Most Distinguished Order of St. Michael and St. George, a Colonel in the Militia of Canada, etc., etc., *Lieutenant-Governor of the Province of Ontario.*

MAY IT PLEASE YOUR HONOUR:

I herewith present for consideration of your Honour the Annual Report of the Ontario Vegetable Growers' Association for 1913.

Respectfully yours,

J. S. DUFF,

Minister of Agriculture.

TORONTO, 1914.

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Ontario Vegetable Growers' Association

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Representative to Canadian National Exhibition: THOS. DELWORTH, Weston.

Representatives to Horticultural Exhibition: W. J. RUSH, F. F. REEVES, THOS. DELWORTH, JAS. DANDRIDGE.

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Prize Vegetables from the Field Crop Competitions.

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Ontario Vegetable Growers' Association

NINTH ANNUAL CONVENTION.

The ninth annual convention of the Ontario Vegetable Growers' Association was held in the Parliament Buildings, Toronto, on Wednesday, November 19th, 1913.

This year's convention was the largest and most enthusiastic in the history of the organization. Every delegate attended all the sessions, and great interest was maintained throughout.

PRESIDENT'S ADDRESS.

C. W. BAKER, LONDON.

I welcome you to the ninth annual convention of the Ontario Vegetable Growers' Association—you men and women the choice of your several branches, the pick of the growers in this fair province, you of foresight and vision, who are seeking for knowledge and new ideas in vegetable growing. We appreciate your presence.

Let us have a real heart to heart talk. When discussion opens let every delegate feel at perfect liberty to take part; it is your privilege, your duty, your opportunity. Accept it and improve the time, express your approval or your objections and feel at home in this convention of the progressive men and women of the vegetable growing industry of Ontario.

Let us to-day look at things with provincial eyes, and have a wide outlook. Let us dream dreams of this Garden of Canada and her future as the greatest vegetable-producing Province in the Dominion. Let each one do his share of development. Do not ask will it pay? Build and make it pay, plant and make things grow. Have faith, have foresight. Our towns and our cities are adding to their population rapidly. They must be fed, markets are widening, the public are demanding first-class vegetables. Let us produce the best and demand the best price.

Time was when man had merely to plow the land, plant, and gather the crop. But conditions have changed in recent years. The woodlands have been stripped of timber, the result is more cold winds and less water in creeks and rivers. Insect pests are too numerous for an ordinary mortal to mention. High priced labor takes business ability to make ends meet, and so with all these and many more adverse conditions the vegetable grower must be up-to-date in his methods, must know the best way and practice it, use his brains as well as muscle, and be willing to accept new methods and ideas, if he would succeed. How best to keep up-to-date is the question. Allow me to answer: Be a member of the Ontario Vegetable Growers' Association, which has made progress of such a nature that the government of this Province have seen fit to help us with its scientific men and also with considerable funds, and we are able to report progress.

Our main work is to bring you together to discuss, to plan, to work out new and better methods of production, and so remove suspicions and prompt fellowship. To co-operate in buying supplies and selling our produce. To work hand in hand

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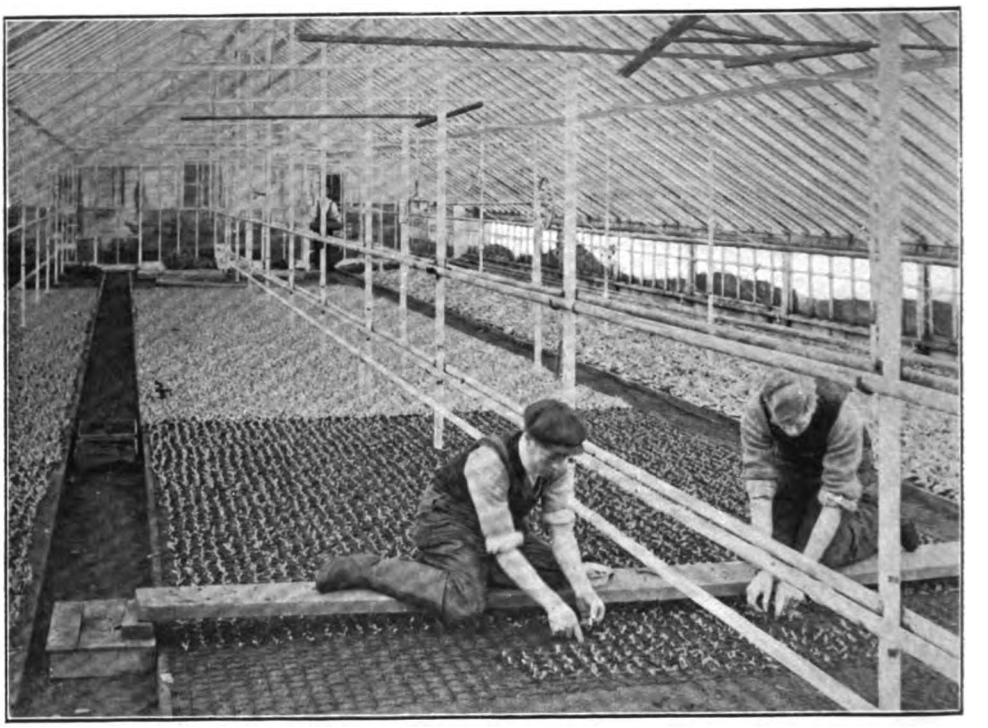
with our agricultural experts in experiments in the production of new varieties and improvement of the old. To produce in New Ontario seed potatoes, seed peas and to distribute among vegetable growers of the Province. To bring before the notice of the Federal Government the desirability of having a Dominion Statute providing certain weights per bushel and bag of vegetables, protecting both seller and purchaser in every province. By the generous aid of our Governments we have been able as our Association to gather much interesting and valuable information regarding growing, storing, packing and selling of vegetables in many of the largest vegetable growing districts of the United States.



Transplanting Lettuce.

Co-operative buying of all supplies needed by our members is a new departure this year under the leadership of Vice-President, W. J. Kerr. Mr. Kerr will address us later on this subject.

The Field Crop Competitions in vegetables are one of the very best things we have been able to accomplish. Toronto, Ottawa and London Exhibitions have witnessed the staging of the finest of celery, onions and tomatoes that Ontario can produce, an object lesson and a surprise to many.

Holding meetings addressed by practical men during the winter season is of immense value to our members. Garden visits, social evenings, picnics, excursions, annual banquets, membership competitions, are all of value in maintaining interest in our Association.

We must interest the young people, because the future lies before us. We are a very necessary branch of the agricultural producers of this Province and are vitally interested in every thing that tends toward improvement in our industry.

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Individualism is a back number. In all walks of life, in all business we find men associating with one common object, and accomplishing by concerted action work that the individual would utterly fail to realize. There will be no slacking of demand for vegetables, but an ever increasing call for quality, quality, quality! Let us by employing good seed, rich and well tilled soil, good methods, up-to-date grading and packing, put first quality vegetables on the market and realize the highest prices.

This year has been one of varied weather conditions, some parts of this Province suffering from drouth, but, as a whole, we have had a fairly prosperous year with a progressive spirit prevailing among the growers. A large number of our members are constructing or contemplate building new greenhouses. These are men of vision, they have dreamed dreams and expect them to come true. They will; the future is bright for vegetable growers.

I would recommend the following: Organize new branches, bring influence to bear on the Federal government to pass a bill regulating weights and measures, encourage branches to increase membership, experimental work in colleges, co-operative buying of supplies, selling circles in some localities, and field crop competitions. If we had some trade paper that we could each have at our homes weekly, or monthly, and thus be closely in touch with each other, and know what the others are doing, it would be of great benefit to an association like ours.

J. LOCKIE WILSON: The next item on the programme is the discussion on the President's address. This is perhaps as fine a President's address as we have ever had in the history of the Association. That is not saying anything disparaging against Mr. Baker's predecessor who was a good man and true, and did excellent work, but, to my mind, this is one of the finest addresses that we have heard, and in it there is plenty of room for discussion.

W. J. KERR: It is just such addresses as this, that enthuse one. Energy and ambition help to make the Association a success, and the spirit of co-operation which we will discuss this afternoon, is well put before us. In my estimation it is one of the most important points in connection with the work of the Association to cut away from the old selfish idea that if we have any knowledge we must not, under any consideration, let any other person know anything about it. We must let our light shine, and if we welcome the members of our Association and get them interested, and inculcate good fellowship, it will be of great benefit to the business of vegetable growing, and we each individually will reap the benefit to the fullest extent possible.

J. J. DAVIS: It seems to me that if we could have an annual banquet in connection with our annual convention it might, perhaps, bring along a great many members of our Association who do not come, as a rule. I would like to see a larger gathering and more members interested. I have come here and gained enough to pay me for coming. But you know there is oftentimes something to be gathered and stored before winter sets in, and men do not like to leave it. If there was, however, a social as well as a business side to the Association, it might induce others to come who do not attend at present.

C. F. W. DREHER: An important point was brought up in the address, namely: that we should have a paper to represent your Association in which you could discuss all matters dealing with vegetable growing and horticulture in general. It would be well for a member to take it up and make a motion to ask one of our present papers to devote some pages to it, or if you wish, to establish such a paper.

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J. W. HYATT: I am delighted with the address. It is full of optimism and the spirit of progress. The suggestions build up and put the spirit of life into one, making it worth living. The most important feature before us is the development of co-operation. I believe to-day that the market end of farming is where

Celery Exhibit from O. V. A. Competitions.

we should lay emphasis. Whilst we have been struggling in the past with a vision, and asking for wider markets, within our doorstep has been set a skeleton between the producer and the consumer. We must get past that devil-strip. We want co-operation for until we get that between the producer and the consumer we cannot do much to reach across that strip. We have a great work to perform.

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REV. A. H. SCOTT, President Ontario Horticultural Association. It is a very great pleasure for me to be with the vegetable growers this morning. A word with reference to the gentleman whose voice I hear for the first time, from Prince Edward. Something touches me about that, because it was in that county that I preached my first sermon. I have been going on for thirty-five years preaching sermons, and I expect to go on, until I am perhaps an octogenarian, getting inspirations of the kind I have received from this convention. I have wondered since I became President of the Ontario Horticultural Association, why it is that these two Associations are two distinct bodies, for a vegetable is as much horticulture as a flower is.

I am very sorry that I missed the President's address, which has been spoken of so highly. We wish the vegetable growers abundant prosperity. This is God's work. It is encouraging work, a work that is at the very foundation of provincial and national prosperity, and the more we magnify it, and realize its greatness and goodness, and far reachingness the better for us in our manhood, and the better for us in our nationality.

THE PRESIDENT: We are pleased to have the President of the Horticultural Association with us. It is the first time we have had a representative from that organization with us, and we appreciate his presence. We should be a little more closely allied with the other societies and we will be.

R. DENGATE: I was very pleased with the President's address, and it was worth the fare of any member of the Society to come here, no matter what it cost him. Our members miss a great deal by not coming to these gatherings. I should like to see the address in print in the papers, so that members of other associations who have not had the privilege of hearing the President would be able to read it. I believe that it would enthuse them so that they would want to come and help us. I have often thought that if we had some way of communicating with each other as to the amount of the crops that are in the country, it would be a good thing. If there is abundance of crops we should sell as soon as we could; if there is a scarcity it would pay us to hold for a little while. We get market quotations but they are in, perhaps, for two or three months without change. We do not know what the price is, but if we had a page specially for us we would be able to understand and know more about the market prices. Speaking about weights and measures, I understand that carrots are supposed to weigh 60 lbs. per bushel. Mr. Wales told me yesterday that it takes about five pecks of carrots to make a bushel. These things want changing.

THE PRESIDENT: These are the figures and weights per bushel proposed. If we could get legislation for these weights I think it would be satisfactory to both the vegetable growers and to our friends who purchase.

Artichokes	56 lbs.	**Parsnips**	45 lbs.
Beets	50 lbs.	**Potatoes**	60 lbs.
Carrots	50 lbs.	**Turnips**	50 lbs.
Onions	50 lbs.		

Per bag the weights are:—

Artichokes	75 lbs.	**Parsnips**	60 lbs.
Beets	70 lbs.	**Potatoes**	80 lbs.
Carrots	70 lbs.	**Turnips**	70 lbs.
Onions	75 lbs.		

A. G. ADAMS: I have a grievance to ventilate in regard to the reporters who have taken the notes of these meetings in the past. I do not wish them to feel

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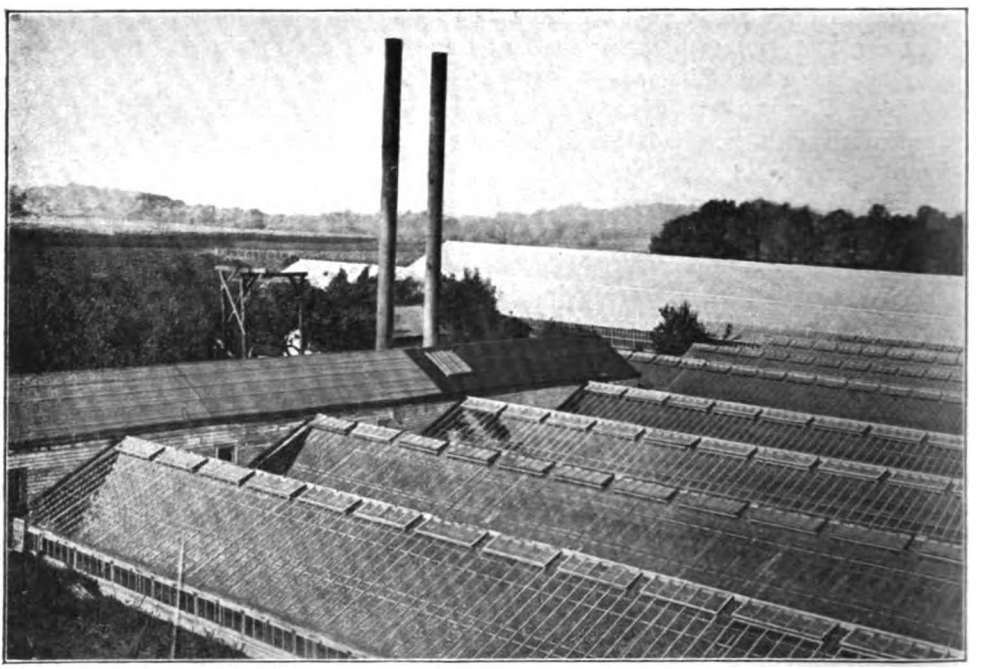
hurt; it would be well for them to be very careful as to the reports they take down of the addresses given. I made an address last year stating the freight rates as between Ontario and the Maritime Provinces. I contended that we were certainly discriminated against. The Railway Board tells me that we are, and that we have a good case to go before them. I made a statement that the rate on vegetables to New Brunswick was 32c. per cwt. and that their rates back on the same goods was 26c. I have been hauled over the coals by representatives of the railroads who have sent letters to the *Globe* and other papers denying absolutely my statements, and stating that they were false. That is the reason that I would ask the reporters to be very careful, so as not to get any one into trouble. The President's address breathes a great deal of optimism. It is very encouraging to hear the head of this Association take such a high stand. He is a younger man



View of five acres under glass.

than I am, and I would like to say to the young men here, that they have their place to make in the Province as well as in the family, and I should like you to pay attention to what some of the older men may say. Not that we know everything. We have a lot to learn, but the younger men should be very careful to study all the points they can get from the older heads and work out the new systems from their own standpoint. You will find that you have a lot to learn in connection with vegetable growing. At every convention we get something of value.

J. J. DAVIS: In the last annual report I am quoted as saying that we got a dollar and a half for lettuce. The London growers think that I told some "fairy stories." The point under discussion was: I was asked why we did not grow big Boston lettuce? I said it would not pay us in London. It was only last week that a man was "jollying" me about it, and they are not all as charitable as he was. Some of them think a man comes here for the sake of hearing himself speak, and is not at all careful about what he says.

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REPORT OF THE SECRETARY-TREASURER.

J. Lockie Wilson, Toronto.

For the greater part of a decade the Ontario Vegetable Growers' Association has been carrying on a work that has added materially to the social and financial standing of our members throughout the Province. Beginning, as it did, in a

Experimental Plots of Cabbage.

small way, its membership has increased in numbers and influence each year, and, latterly, it has conducted most valuable experiments in vegetable growing in Ontario's Northland. These have proved beyond peradventure the value of the soil and climate of New Ontario as a seed-producer for the gardeners in other sections of Canada. Its soil is specially adapted for the growing of timothy, clover, peas and potatoes. Our experiments were, of course, particularly with the

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two latter crops. Last year we distributed among our members nearly 500 bags of potatoes and a large quantity of peas grown there and the results have been satisfactory. We will have a quantity of these with which to supply our members next season, as we are continuing this line of experimental work.

Field Crop Competitions.

The Field Crop Competitions inaugurated by our Executive in 1912 were continued this year and proved an incentive to the improved cultivation of better varieties, particularly in tomatoes, onions and celery. The following were the rules and regulations under which the contests were conducted, and the entries were more than double those of the previous year:

The Province was divided into four districts.

1. Ottawa, Kingston, Picton and Belleville.
2. Toronto, Dunnville, Simcoe, Hamilton, St. Catharines and Welland.
3. London, St. Thomas, Aylmer West, Woodstock and Brantford.
4. Sarnia, Blackwell, Stratford, Ojibwa and Tecumseh.

The members of the branches in each district competed among themselves for the prizes offered in their district.

The plots entered for each of the above named vegetables were not less than one quarter of an acre.

Not less than ten entries in each class of the above named vegetables from each District were accepted and all entries had to be made by May 15th.

Members could compete in one, two or all of the three crops mentioned.

The competition was limited to the first thirty members making entry from each District, and entries were accepted in the order in which they were received from the Secretary of the Branch.

The entrance fee was one dollar for each crop.

All prize winners in the Field Crop Competition had to compete for the large prizes offered at the Canadian National Exhibition, Toronto; the Central Canada Exhibition, Ottawa, and the Western Fair, London.

Judges were supplied free of charge by the Ontario Department of Agriculture.

The following were the prizes offered in each District for each of the three crops, onions, tomatoes and celery: 1st, $25; 2nd, $20; 3rd, $15; 4th, $10.

The following prizes were offered for each crop at the Canadian National, Canada Central and Western Fair open to prize winners in the Districts (in onions, tomatoes and celery): 1st, $10; 2nd, $8; 3rd, $6; 4th, $4; 5th, $3; 6th, $2; 7th, $1.

Prize winners at the Canadian National Exhibition, Toronto:

Celery.

	Name.	*Address.*	*Variety.*
1st prize	Jno. Harris & Son	Belleville	Paris Golden.
2nd "	W. R. Trott	London West	White Plume.
3rd "	Chas. Dabbs	Mount Dennis	
4th "	G. W. Bycroft	London R. R. 7	White Plume.
5th "	P. A. Bell	Humber Bay	
6th "	T. J. Davis	London R. R. 7	White Plume.
7th "	Jno. Tizzard	Humber Bay	

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TOMATOES.

	Name.	Address.	Variety.
1st prize	J. A. Humphrey	Stratford	Earliana.
2nd "	G. W. Bycroft	London R. R. 7	Byron Pink.
3rd "	F. F. Reeves	Humber Bay	
4th "	W. Trick	Ottawa	First and Best.
5th "	J. J. Davis	London R. R. 7	Byron Pink.
6th "	J. Cox	Eastview	Pink.
7th "	Jas. McConkey	Brantford	Earliana.

ONIONS.

1st prize	Chas. Aymer	Humber Bay	
2nd "	F. F. Reeves	Humber Bay	
3rd "	G. H. Poad	London R. R. 8	Yellow Danvers.
4th "	Jos. Norris	Eagle Place	Yellow Globe.
5th "	Chris. Dent	Sarnia R. R. 1	Yellow Danvers.
6th "	Wm. E. Crandall	Ingersoll	Yellow Danvers.
7th "	J. A. Farquharson	Ottawa	Red Wethersfield.

PRIZE WINNERS AT THE CANADA CENTRAL EXHIBITION, OTTAWA.

CELERY.

	Name.	Address.	Variety.
1st prize	Jno. Harris & Son	Belleville	Paris Golden.
2nd "	W. R. Trott	London West	White Plume.
3rd "	H. Easterbrook	Pelham Corners	
4th "	J. J. Davis	London R. R. 7	White Plume & Paris Golden.
5th "	Chas. Dobbs	Mount Dennis	
6th "	Jno. Tizzard	Humber Bay	White Plume.
7th "	G. W. Bycroft	London R. R. 7	White Plume & Paris Golden.

TOMATOES.

1st prize	G. W. Bycroft	London R. R. 7	Byron Pink.
2nd "	J. J. Davis	London R. R. 7	Byron Pink.
3rd "	F. F. Reeves	Humber Bay	
4th "	J. Cox	Eastview	Pink.
5th "	Harper Secord	St. Catharines	
6th "	W. Trick	Ottawa	First and Best.
7th "	Jas. McConkey	Brantford	Earliana.

ONIONS.

1st prize	Chas. Aymer	Humber Bay	
2nd "	Jos. Norris	Eagle Place	Southport Yellow Globe.
3rd "	F. F. Reeves	Humber Bay	Red Wethersfield.
4th "	W. H. McConnell	Aylmer	Red Wethersfield.
5th "	J. A. Farquharson	Ottawa	
6th "	D. Dempsey	Stratford	Yellow G. Danvers.
7th "	G. H. Poad	London	Yellow Danvers.

PRIZE WINNERS AT THE WESTERN FAIR, LONDON.

CELERY.

	Name.	Address.	Variety.
1st prize	W. R. Trott	London West	White Plume.
2nd "	Jno. Harris & Son	Belleville	Paris Golden.
3rd "	Chas. Dobbs	Mount Dennis	
4th "	J. J. Davis	London R. R. 7	White Plume & Paris Golden.
5th "	P. A. Bell	Humber Bay	
6th "	W. Trick	Ottawa	Paris Golden.
7th "	Cooke Bros.	Cataraqui	Paris Golden.

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TOMATOES.

	Name.	*Address.*	*Variety.*
1st prize	W. B. Johnson	Dunnville	
2nd "	G. W. Bycroft	London R. R. 7	Byron Pink.
3rd "	J. J. Davis	London R. R. 7	Byron Pink.
4th "	F. F. Reeves	Humber Bay	
5th "	E. W. Grummett	Echo Place	Earliana.
6th "	Harper Secord	St. Catharines R. R. 2	
7th "	W. A. Birdsall	Sarnia R. R. 2	Moore's King of the Earlies.

ONIONS.

1st prize	F. F. Reeves	Humber Bay	
2nd "	Chas. Aymer	Humber Bay	
3rd "	Jos. Norris	Eagle Place	Yellow Globe.
4th "	Chris. Dent	Sarnia R. R. 1	Yellow Danvers.
5th "	Fred. Somes	Sarnia R. R. 3	Yellow Danvers
6th "	G. H. Poads	London R. R. 8	Yellow Danvers
7th "	R. Hachborn	Echo Place	Yellow Danvers

Express charges on the prize winning vegetables entered at these exhibitions were paid by the Ontario Government.

The judges sent out by the Department to judge the crops in the field were well-known experts.

We hope to be able to continue this work on a larger scale in 1914. The vegetable display at the above named Exhibitions attracted a great deal of attention and much favorable comment.

The Ottawa Branch again this year put up a most creditable exhibit at the Central Canada Exhibition at no cost to the Central Organization. This was one of the main features in the Horticultural Hall and at the close of the Exhibition all the fruit and vegetables were distributed among charitable institutions in the city. This Branch has shown a broad spirit of philanthropy to the other organizations in the Province.

There still remains a wide gap between the prices received by the producer and those paid by the consumer, but the spirit of co-operation is in the air and the Ontario Government is investigating the co-operative systems in vogue in the lands beyond the sea, and the Report of the Investigation Committee appointed is looked forward to with great and increasing interest.

I wish to congratulate the Association on the splendid work which is being accomplished for the members by Mr. W. J. Kerr, who was appointed purchasing agent by the Directors in 1912. In looking over his price list quoted to members of the Association as compared with those of some of our Canadian dealers, in many cases several hundred per cent. will go into the pockets of our members who purchase direct from him.

SYNOPSIS OF REPORTS FROM BRANCHES.

Stratford.—This Branch shows an increase in membership of 100 per cent. Additional members were secured by a contest of the members at the North Perth Exhibition. Co-operative purchase of seeds and baskets at a saving of 5 per cent. to 25 per cent. A suggestion is made by this Branch that the membership fee be increased to $1.00 so that funds will be available for making meetings more interesting.

St. Thomas.—Shows a decrease in membership. Co-operative buying of supplies, particularly fertilizing and spraying materials, amounted to several thousand dollars. A co-operative selling association was also organized.

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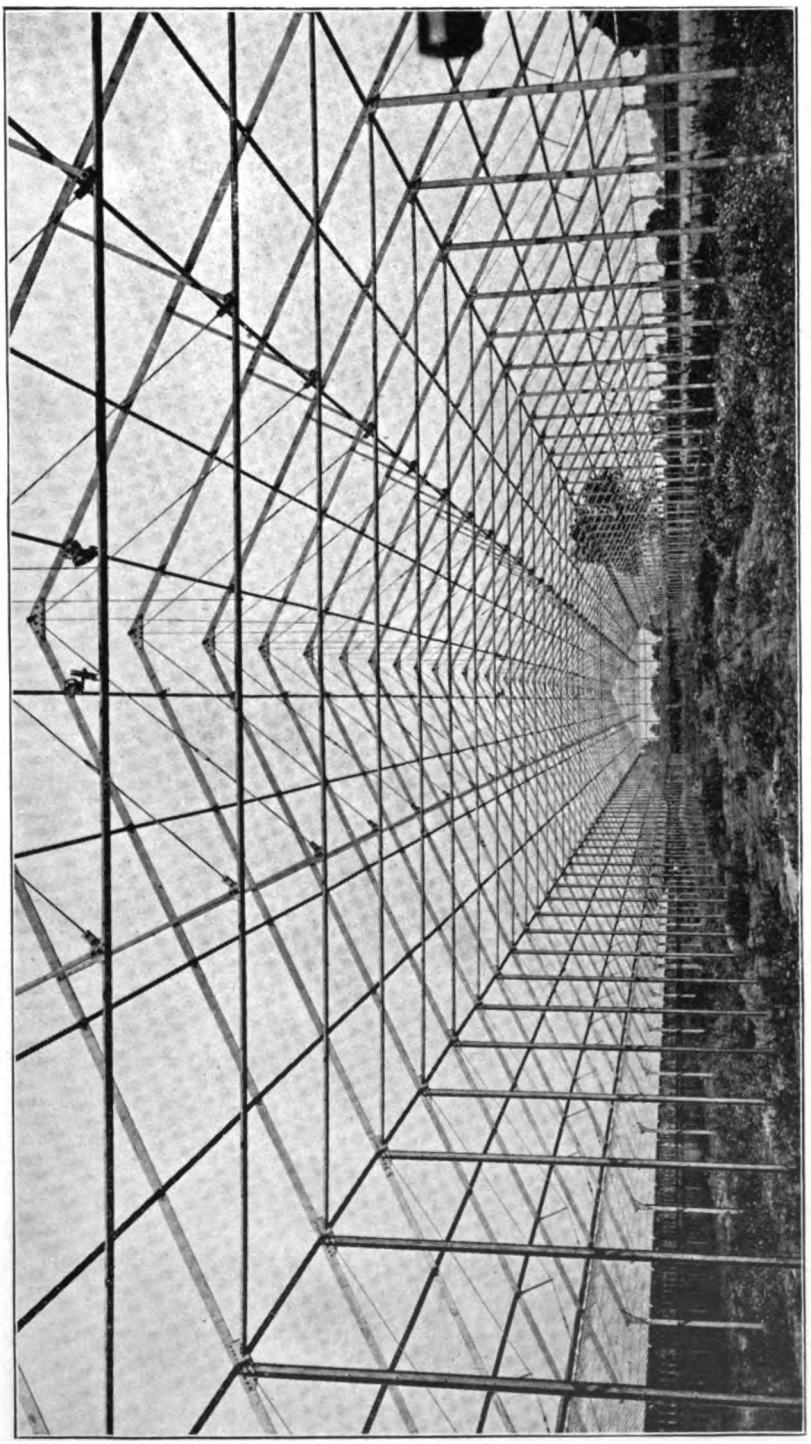

Iron Frame Greenhouse, 75 ft. x 460 ft.

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Belleville.—Shows a slight increase in membership. The members are interested in the Field Crop Competition and were fortunate enough to win first and second prizes. Orders have been sent by this Branch to the purchasing agent of the Ontario Vegetable Growers' Association, and the report shows that the outlook for 1914 is indeed bright.

Aylmer.—Confined its efforts to holding meetings for the instruction of its members in the growing of vegetables and in the value of co-operative buying. A quantity of supplies were purchased co-operatively.

Blackwell.—Sold during the season of 1913: rhubarb, radish, lettuce, bunched beets, carrots, turnips, onions, strawberries, cherries, beans, cabbage, potatoes, sweet corn, tomatoes, cucumbers, peppers, celery, cauliflower, squash, pumpkins, pickling cucumbers, pears, plums, peaches, apples in baskets, boxes and barrels.

Total amount shipped up to date: 1093 tons or 91 carloads of 24,000 lbs. Increase of business over season of 1912, 33 per cent. representing an increased value of $10,380.00. Value of largest day's shipment, $2,081.00.

Salesman's commission 6 per cent. on all sales. This commission to cover travelling expenses, discounts on drafts, telegrams, telephone, postage, stationery, office help and minor losses.

One field of 4¼ acres planted with early Ohio potatoes, northern grown seed, yielded 250 bushels per acre, which were harvested in early August.

One plot of two acres of ballhead cabbage yielded 550 crates or about 45 tons. The above were all exported North and East.

Picton.—Co-operative buying of plant boxes, berry baskets and eleven and sixteen quart baskets, thus securing more favorable prices.

St. Catharines.—This is a new Branch starting out with 25 members. Field meetings and social gatherings were held for the benefit of the Society. Three members entered in the Field Crop Competition and captured first prize. No buying or selling was done co-operatively, but they expect to avail themselves of the opportunity of buying seeds through our purchasing agent.

London.—Shows increase in membership and did some co-operative buying of baskets and fertilizers.

Ottawa.—"We hold a number of meetings during the year, the summer meetings being held in the gardens of a number of our members and at the Experimental Farm.

"We bought a considerable quantity of seed in Europe and the U.S., all of which except Barletta pickling onions gave the very best of satisfaction. These latter bought from the State of Iowa turned out not true to name. With this exception, every variety we bought gave us most excellent germination and very satisfactory quality of crop. Our saving in cost was very much.

"We ran an excursion to Macdonald College, St. Annes, Que., which proved very interesting and instructive, and gave us some surplus cash. We awarded a lot of special prizes at the Central Canada, and Aylmer, Que., Exhibitions for the encouragement of our members in the production of the best possible. We also made another special display of our products at the Central Canada Exhibition, and were awarded another diploma. We bought a car of fruit boxes and baskets at a saving of nearly $200. In all we have expended this year a little over $1,125.00 in the encouragement of our members, and assistance to them in various ways. We have sixty-five members at the present time."

Brantford.—We purchased one carload of baskets which were sold to the members at cost, and also purchased seed direct from the growers. This line of work will be followed up in 1914 as we are just beginning to understand the benefits of co-operative buying.

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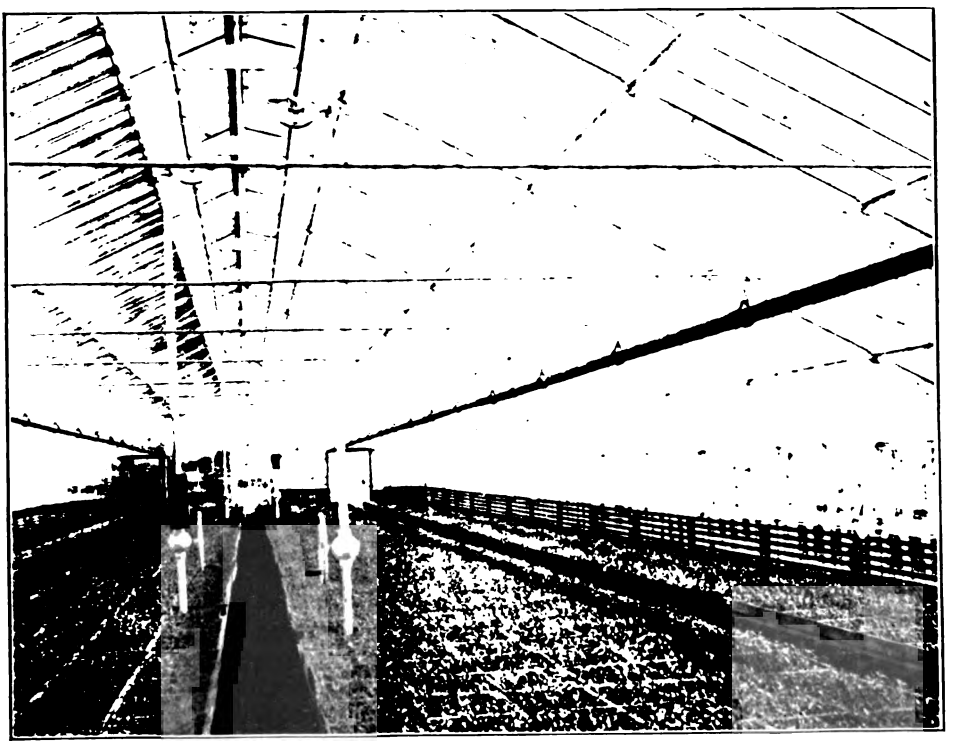
Vegetable Growing near Toronto.



Lettuce in Flats.

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Fonthill.—We held meetings at the homes of our members and one of them was addressed by Prof. MacLennan of Guelph. We expect to go in for co-operative buying on a large scale next year.

Tecumseh.—This Branch is doing good work and had a successful year. The County Council has become interested and gave them a grant of $50, and they have also received $25 from the Township Council. Prizes were offered and some co-operative purchasing was done.

The scarcity of additional labor is still a burning question with us and if market gardeners of Ontario are to keep pace with the demand for their produce, more strenuous efforts must be made to secure skilled gardeners.

The Bill for fixing Standard Weights for bag and bushel of vegetables has not yet become law. We trust that at the incoming Session of the Federal Parliament this important legislation will not be overlooked.

If arrangements can be made to secure lower freight rates from Northern Ontario to the Cities of the older portions of the Province, our Northland will in the very near future be able to supply our citizens with the finest quality of potatoes at reasonable prices. From 200 to 300 bushels per acre can easily be grown on the practically free grant lands available for settlement in Ontario's great hinterland. With potatoes selling at $1.20 per bag in Toronto at the present time and the probability of higher prices prevailing in the near future, the crop that unskilled labor can easily produce should be an incentive to the incoming immigrant to shake the dust of our cities off his feet and get into the gardener's game.

"His work then will be one of worth,
A partner with the sky and earth,
A partner with the sun and rain,
And no man loses by his gain."

Pure Seed.

Reports received from many of our members state that the seed supplied this year was in many instances superior to that procured in previous years. Pure seed is of vital importance to the progress and prosperity of our gardeners and our members are becoming rapidly educated along this line. Our seedsmen are, evidently, exercising greater care in its selection. It is better to pay a fair price for good seed than to jeopardize a crop by experimenting with varieties simply because the price of the seed is marked down. The chief requisite is to have uniformity of type, and improvement is possible in procuring seed of varieties which are capable of resisting disease.

Marketing.

While the question of production is a great factor, marketing of the crop when grown is supremely important and should receive the careful consideration of the delegates attending this convention. Grading and packing count largely in the returns received from consumers. Remunerative prices cannot be obtained unless our products are skillfully packed according to the most improved methods. Vegetables when they reach the consumer must be attractive in appearance. Each lot must be carefully graded and should be uniform in color, size and shape. All vegetables shipped should be clean and free from scars by insects and mechanical injuries. Packages should be clean and tastefully arranged. Housewives prefer

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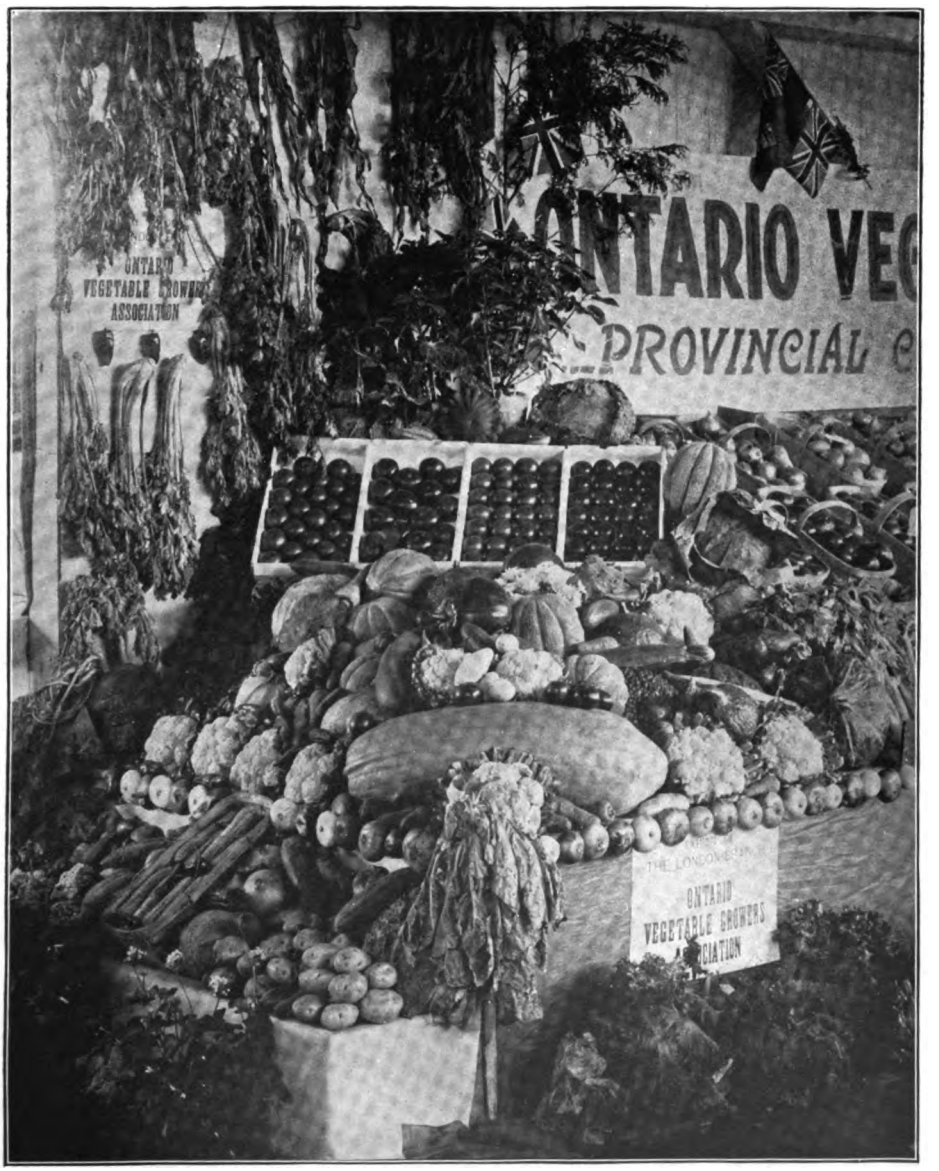
vegetables done up in small containers, as they are easier handled and more convenient for the purchasers in carrying them to their homes. Many of our growers give little attention to the manner in which their goods are placed on the market. They are shipped in dirty and unsightly baskets and boxes, and, even if they con-



Celery Exhibit from O. V. G. A. Competitions.

tain the finest quality of vegetables, they are passed by and sold at inferior prices. Vegetables which look well generally sell well; then have a care that this important part of your work is not neglected.

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ORGANIZATION.

In 1914 our organization should extend its borders so that all those interested in gardening should have the opportunity of becoming members of our Association. We should have at least 1,000 more members next year, and we can easily have that increase if each one does his part.

The Executive held fifteen meetings during the year.

FINANCIAL STATEMENT

For eleven months, November 30th, 1912, to October 31st, 1913.

RECEIPTS.

Balance on hand from 1912	$72 54	
Grant	800 00	
Entry fees at Horticultural Show, 1912	11 00	
Membership fees	94 90	
Seed potatoes sold	396 05	
Entries for Field Crop Competition	130 00	
Gradus peas sold	56 59	
		$1,561 08

EXPENDITURE.

Expenses of Convention, 1912	$155 55	
Expenses of Directors' Meetings, 1913	237 50	
Fourteen Executive Meetings, services and expenses	145 35	
Expenses of Exhibit at C. N. E., 1912 and 1913	36 20	
Expenses of Exhibit at Western Fair, 1913	25 11	
Photos of Exhibits at Horticultural Show and C. N. E.	10 00	
Prizes paid in Field Crop Competition	270 00	
Stenographic services, October, November and December, 1912	5 00	
Stenographic services, 1913	15 00	
Freight on potatoes from Northern Ontario	91 02	
Growing seed peas	43 34	
Growing seed potatoes	192 50	
Expenses of delegates to Leamington	18 75	
Badges for Convention, 1912 and 1913	9 50	
Expenses addressing meetings	8 30	
Membership Competition, 1912	30 00	
Auditing	5 00	
Lawyer's expenses	2 80	
Petty cash	10 00	
Postage	10 00	
Refund of entry fees for Celery, District 4	3 00	
Stationery	30 50	
Organizing	21 50	
Express on potatoes shipped to Canard River	1 01	
Expenses of delegates to Montreal	27 70	
Delegation to Ottawa *re* Weights and Measures Bill	50 70	
		$1,455 33
Balance on hand		105 75
		$1,561 08

I wish to congratulate the officers and members of the Association on the excellent work done during the year and trust that 1914 will be a record year for progress in every line of endeavour.

W. J. KERR: I wish to comment on the able address of our Secretary. The President's address was full of optimism and the Secretary's was full of information, and we should certainly make a success of our institution with both these

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qualities. He read the list of winners, and the varieties that won prizes, with the idea that we should take them as indications of the most desirable varieties. We find that in some sections some kinds are grown that will not do so well in other sections. In this district and in the West the yellow onion sells in preference to any other. In Ottawa it is not so much in demand as the red onion. In London White Plume Celery is the one most grown, and Mr. Trott's was one of the finest fields I ever saw. In some sections we find the pink potato like the early Ohio the most desirable; in others the early white. With regard to co-operation of the people in the Cities, this spirit in our city has sprung up among the householders and we have some co-operative stores. I have spoken about the efforts of the Ottawa growers to get improvements in our market regulations. We worked throughout the year educating the Council as to the advisability of making changes, but at the next election a lot of the Councillors are defeated and we have to start the educational process over again with new men. We found that the market gardener in Toronto is getting as good prices for his stuff selling to the grocers, as we are selling to the householders in our market. The gardener here does not make such early starts, so I do not know that the recommendations are greatly in the interest of the grower; but the householders find that the recommendations we have made are in their interest, and the most influential men in the City waited on the City Council, and demanded that they grant the desired changes which we asked. A co-operative Association must have a competent head. If we are not managed by an institution or by a man who is willing to give it his time—not a gentleman of leisure but a busy man, it is not apt to be a success. Another subject mentioned by the Secretary, is going to the Council for financial assistance. I think we were the first at Ottawa to start that idea. We went to the Council and asked for $50. Some of them thought that we had a great deal of gall—the idea of asking for money to help us in our organization—but we got it. Then we went to the townships in which the members lived, and asked each of them for $20. This was given and next year we got the same amount, one even giving us $5 more than we asked for. They recognized that the Association was increasing the wealth of the community. There is a case where a President of a Branch and his son are making excellent livings—they are well off—on four acres of land, and they have made the money off that four acres, and if we can place a family on every four or even ten acres of land who can make good livings, is not that better for the community than having 150 or 200 acres cultivated by a similar number of people for holding? I hope the members will think seriously of the suggestions made by our Secretary, who has given this matter very great thought. If we follow his advice we will come here next year in increased numbers.

IRRIGATION AND ITS PRACTICAL RESULTS.

J. J. Davis, London.

In the course of the year we get a great variety of weather. A man who has a good supply of water over and above what falls from the clouds will find it a material aid to his business. Our work is different from that of others. For instance if a milkman gets water into his business he gets into trouble, and there is an outcry made. And there are men who are behind prison bars through no other reason than selling watered stock; but we can sell it with impunity, and get

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a premium for doing so. I have had a good deal of experience of irrigation and will speak to you for a few minutes on the subject.

I remember when I started watering I had a fine patch of pickling cucumbers, and it was an excessively dry season. I was needing money badly, and I saw things were going wrong. I had a well 60 feet deep, an old-fashioned wooden pump. I pumped water by hand, raised it into a barrel and wagon, and drew it to the cucumber patch. I could not get near enough to water by hand, but I got it to run from a distance of fifty feet. The results of this crude and laborious system were so good, and opened my eyes so much to the value of water, that I began to turn my attention to better systems. Then I got a windmill and tanks, and watered for awhile in that way. That was a great deal better though it was very slow and very limited. When the wind blew you got water, but none when it did not, and perhaps you wanted it most when it did not blow. Then I got a gasoline engine, and laid pipes through the fields, started the engine, put on hose, had openings where you wanted to take the water off, attached the hose and ran the water. That was pretty good. You could get out a lot more water in a day by that method. But the trouble with that was that it took a great deal of time in applying the water, and often when you wanted it perhaps you had some hundreds of baskets of tomatoes to pick to prevent them from spoiling and you could not do so and water at the same time. Then a neighbor went to a meeting and saw the "Skinner" system and thought that it was just what we wanted, and so we went in for that. Now the advantage the Skinner system has over any other that I have tried is that it applies the water itself; it eliminates the labor of application. Most of you are pretty familiar with the system. You erect lines of pipe and drill the pipe at stated intervals, insert a nozzle and apply the water with pressure from an engine. Under the old system I have known three of us with a nozzle in our hands all day long applying water. Now I can water just as much ground by the Skinner system by sending a boy to oil up the engine and pump and start them going. When that is done it runs itself until the gasoline or oil gives out. It will run for a day without being looked after. If it runs out of gasoline all you have to do is to fill it up again. The water applies itself and so cuts out labor. Another advantage is that under the other system so long as there was a cloud in the sky a person would put off watering in the hope that it was going to materialize into a rain storm. Often it did not, and in a dry time every day that the crop is going without water is so much lost. With the Skinner system you have another material advantage that it takes less time to start up, so that you do not care whether it rains or not. If it rains you can stop the engine, and anyway, a little more or less does not matter.

There are some points for a person who is going to start a plant for irrigation that I ought to touch upon that would be an advantage to them to know. Be sure and instal a large enough system. You know that often a person will put in a small plant and use a small pipe and think that it will carry as much water as he will require. After a year or two he finds that it is totally insufficient for what he wanted, and instead of being able to have a little on the fields they have to start back at the power house and throw out their pump and engine and buy something bigger. If a person at the start buys a power plant large enough to give good results for the amount of acreage he has under the system it is a comparatively easy matter to buy a few more pipes, and put up another acre or two acres. But if the plant is not large enough there is no use trying to increase its capacity. I have found in my limited experience of applying water that a man who has never done anything in that line has no idea of the amount of water that it takes

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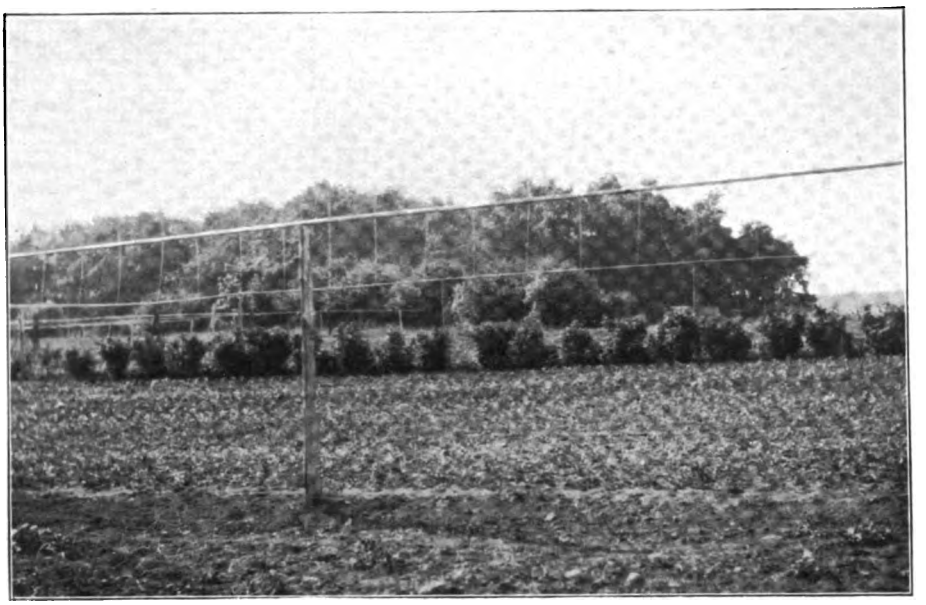

Skinner Irrigation System.

Vegetable Growers' Co-operative Market, Providence, R.I.

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in a dry time to water a small piece of ground. When I have been taking some pretty good fresh looking stuff to market in a dry time, I have heard people say. "He can water all his stuff; it does not matter to him whether it rains or not." That is a mistake. There is a limit even with a large plant. Men have not the least idea of the amount required, or the amount of rainfall even in half an hour's thunderstorm when it comes down pretty heavily. Some think you can put up a windmill and half-inch pipe, and with it water half an acre of stuff. You would hardly keep wet a quarter of that ground. I am not prepared to go into figures as to the quantity of water it takes; the nature of the soil would have a good deal to do with it. Some will take a great deal more than others, but I know that with the outfit that I have got I can put out about 2,700 gallons an hour and that goes on in the Skinner system almost as regularly as in a rainfall. There is practically no water wasted. It is put on just like rain, and stays there till it is evaporated. In the other system there has been more or less waste because the water runs into holes and sinks through the gravel. The year we had the convention in London we had Mr. Coles of the Skinner system with us, and I remember the next morning Mr. Delworth and Mr. Reeves coming out to my place, and were looking over the plants we had in the neighborhood. He complimented me on starting right, with a sufficient plant. He said, "Nine out of ten make the mistake of not starting with a big enough plant, and put up an acre or so, and when they have had it up about a year they want another acre, and have not power enough to operate." So the proper way is to be sure in the first instance that you have a good supply of water, and next have a big enough power plant to handle the amount of water you want. I know enough of the subject to say this: I honestly think if it was not for the water I would go out of the gardening business, and see if I could not find something more profitable. But seeing that I have plenty of water, and can keep things growing, and it is very rarely of late years that I have not had a good crop, I keep on because I am able to apply the things that are necessary for the production of the best.

F. F. REEVES: With regard to the drainage, do you think it necessary to put in more drains when irrigating.

J. J. DAVIS: We have no drains at all. There should be sufficient water applied to keep the crops in good growing condition until the rain comes. That is one of the most valuable points of irrigation. It is not that you are going to undertake to grow a crop on a certain piece of land all through the season without water. You can do it in a greenhouse. The idea is that you can apply a little water during a dry time, and keep your plants in the pink of condition during that time, and as rain comes they get all the benefit there is in the rain; whereas if the plants are half dead it takes all the rain to revive them, and when they get a start the dry weather checks them again. There is no check when the Skinner irrigation system is used. I was successful enough to win the second prize in the field crop competition in celery this year in the London district. I had half an acre of it, and 21,000 plants growing on that half acre. The soil was gravelly, somewhat like what I saw at Leamington, and some people would think a man almost crazy to try to grow celery at all upon it. Yet we do grow it, and to the pink of perfection. On a soil of that nature a man could not grow that enormous quantity of plants and depend on what water would fall in the shape of rain. It would be an impossibility, and a man might be better idle than attempting it. But by having a good watering system, if there comes a dry spell of a week, or two, or even three weeks (of course the longer it lasts the more water you have to utilize), you can keep your crop in good shape until the rain

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does come; and then your plants are in the very pink of condition, get the benefit and grow right along.

J. LOCKIE WILSON: What did your plant cost you completed, and how much land can you irrigate with it?

J. J. DAVIS: I have about four acres under this system, and as near as I can figure it out, engine, pump, pipes, etc., cost about $1,000.

A MEMBER: What width do you put your pipes?

J. J. DAVIS: We have them fifty feet apart, there is a handle on the pipe. You turn it and it goes 25 feet one way. You can set it right over until it throws 25 feet the other way. Each pipe covers a width of 50 feet.

A MEMBER: What pressure do you use?

J. J. DAVIS: I put a safety valve on mine simply because I did not know anything about it. You can run it with 10 lbs. pressure, or 70 or 80 lbs.; but you cannot throw the water so far with a low pressure.

A MEMBER: How far are the nozzles apart?

J. J. DAVIS: We put them three feet. In the Skinner book they recommended four feet, but if you do so when the weather is calm it will shoot a straight stream out to the 25 feet, and drop it right down, and there will be a little space behind that won't get water. If you have the slightest breeze it will break that water up, and it will distribute so that you could not stick a pin on a dry bit of soil.

J. LOCKIE WILSON: What does that mean to us? Here is a gentleman who has put in that system, and made a success of the business. If he had to do away with it what then? If a man intends to produce vegetables at a profit in this Province in large quantities he should adopt this system, or a similar one. We cannot any longer depend for successful cultivation in vegetable growing on the rainfall.

J. J. DAVIS: My statement ought to be qualified perhaps. I meant to say, I would rather quit the business than attempt to carry it on on my kind of soil. There are many different soils. Mr. Reeves has soil that might stand the drouth two or three weeks longer than mine in a dry time. Crops on my soil are quicker, and we need more moisture. It does not matter how much water falls, the soil will not hold it.

A MEMBER: When do you find it best to water, morning or afternoon?

J. J. DAVIS: We start about four o'clock in the afternoon, but it would not hurt to water any time during the day.

A MEMBER: Do you get it from a well or a creek?

J. J. DAVIS: You can use it from any source. I have a good supply of water 10 or 12 feet from the lake. You have to consider that in starting your plan.

REV. A. H. SCOTT: Is it a gasoline engine?

J. J. DAVIS: Yes, I have a 5 h.p. engine. When I started in to pump water through the pipe and take the water away with hose, I got a pump about 5 x 5 that threw a lot of water, and I used a 2½ h.p. engine to run it. It worked very satisfactorily until I put up the Skinner system. Another thing that you must consider is, that it is a difficult matter to pump water through a pipe. Have three or four large openings; that is different to squeezing the water through nozzles, so small that you cannot put a pin in them. You can understand that that means pressure.

A MEMBER: What kind of crops do you grow?

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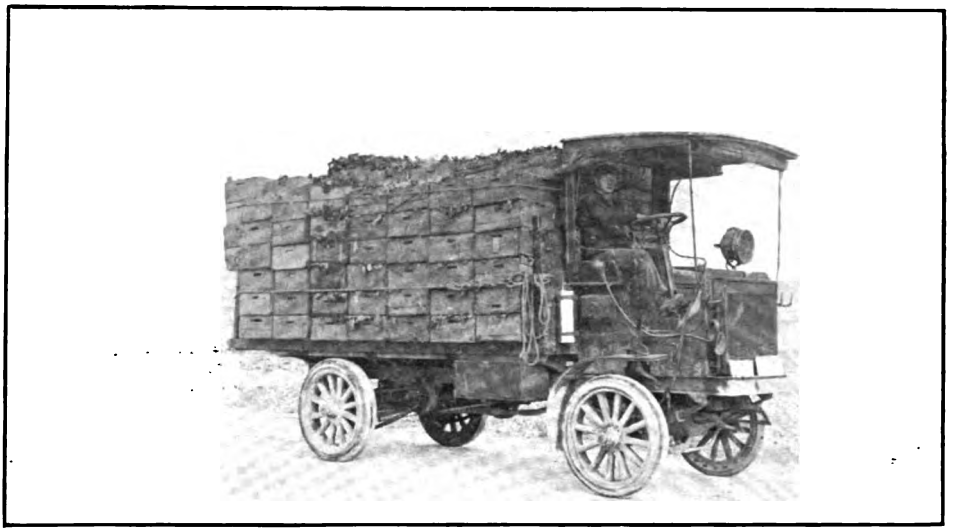
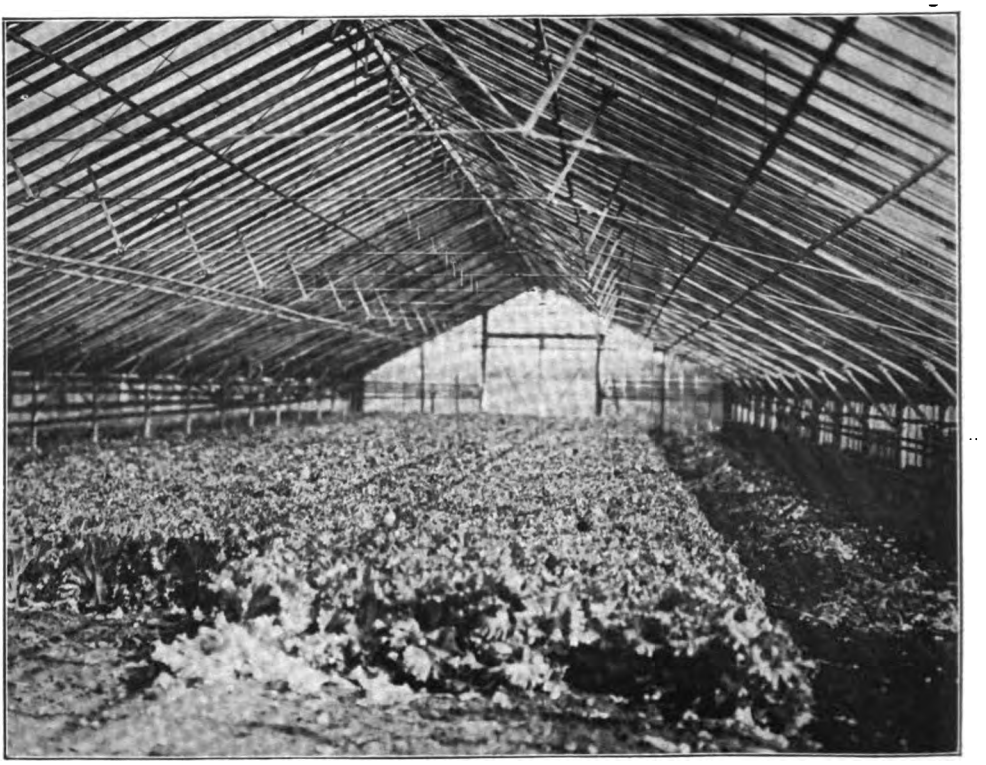


Auto Truck for Vegetables, used on 150-acre Vegetable Garden, Providence, R.I.



Lettuce ready for market.

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J. J. DAVIS: Celery, lettuce, beets, onions, cabbages and potatoes. I have practically given up trying to grow early potatoes and cabbage.

A MEMBER: What soil have you?

J. J. DAVIS: I suppose you would call it gravelly and sandy loam. In some places it is gravelly bottom.

A MEMBER: Can you put the water on it satisfactorily at 10 lbs. pressure?

J. J. DAVIS: You can use it with 10 lbs., but I use 30 or 40 lbs. I have set the valve as high as 80 lbs. to see what it would do. The more lines you open the less pressure you get. If I open all I have, some of them can scarcely send out a dribble. I can shut them all off but three. 70 or 80 lbs. pressure makes it harder on the engine. I find it best to open as many lines as the engine will work satisfactorily If you reduce the speed of the engine you are not forcing so much water. When I found I had to push the water through small nozzles the pump went to pieces. It was not heavy enough. I got a Duplex pump and thought I could run it with the same 2½ horse power engine. So I could by putting on a smaller pulley and running it at half rate of speed. I took out that engine and bought a 5 horse power which I ran for all it was worth. Sometimes you do not want much water, but when the dry time comes you want all you can get, and you cannot get too much or get it too quickly then.

A MEMBER: Would it matter whether you watered in the morning or in the evening; did you experiment, and what was the result?

J. J. DAVIS: I have watered at all times during the day, and never found that it did any harm. There is an old theory that you must not water when the sun is shining strong, but in the greenhouse that is the best time to water, so that the foliage will dry off quickly. I have done the same thing outside and never hurt anything yet, although we generally choose about 4 o'clock p.m., and let it run to nine or ten o'clock at night, if necessary.

A MEMBER: Next to me there is a large grower who has the Skinner system, and he experimented in watering in the morning and in the evening; I watched it and found that the crop watered in the evening was 60 per cent. better than that watered in the morning.

J. J. DAVIS: I do not know how that could be. Half of what you applied in the morning would evaporate during the day, and in the evening there is not half the evaporation to do good.

A MEMBER: Can you grow more than one crop a year under the system?

J. J. DAVIS: Yes, if you spent $1,000 to put in the system you are all the while trying to get it out as quickly as you can. Take this celery field crop competition as an illustration. I had 21,000 plants on half an acre of ground. That crop will average me, say 40c. I get 50c. a doz., and 40c. for most of it, 30c. for the small stuff. You can figure out the amount of money in that half acre, say at 40c. The celery I planted in double rows. There were about 28 inches between the rows and 7 inches between the plants.

A MEMBER: What effect would temperature have on the plants? Do you prefer water from a stream or from a well?

J. J. DAVIS: I would prefer pumping from a river. When you apply cold water you are lowering the temperature of the ground, and it is better to soak it for three or four days rather than dribble a little over it every night. Heat is what produces growth. so it is better to give it a good watering and let it go until it begins to get dry again, when it gets another.

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A MEMBER: It is better to use it the same as a shower of rain, and conserve the moisture by cultivation?

J. J. DAVIS: Certainly. If we get enough rainfall, an acre outside the system would give as good as one inside it. If you do not get the rainfall the other will beat it all to pieces. Did you figure out the value of the celery?

A MEMBER: Yes; $700.

J. J. DAVIS: Well, I could not make that in 700 years without irrigation, simply because the celery would not get bigger than a finger-length. It enables me to grow crops that it would not pay me to attempt to grow otherwise. I could not grow celery on my kind of ground. I am no advocate of a man going in debt, but if I was going to instal the Skinner system and had not enough money to start right, sooner than put in a small plant, and have to pull it out and throw it away, I would borrow a little money to start right. It is an impossibility for a man to get through an inch pipe what water it takes a two-inch pipe to carry. Another mistaken notion is that a man thinks if he has got plenty of power in his engine behind the pump, he can force all the water he wants. He simply cannot do it. A certain pipe will carry a certain amount of water under a good power, and you cannot increase on it. If you try to get over it your pump goes to pieces, or the belt slips off, or something goes wrong. There is a limit to a pipe's capacity, no matter what the pressure is behind it.

A MEMBER: What size of pipe do you take?

J. J. DAVIS: I use 2½ inches; the Skinner people give tables for guidance. I found 2½ inch pipe would deliver 2,750 gallons per hour at 100 feet from the pump. That is about what I wanted. My pump was of that capacity, about 2,750 gallons per hour. If I could not take part of that water at the end of the first 100 feet I would have to start with a 3-inch pipe to make it up. If I wanted to carry it on 200 feet I must tap it, or start with a 3-inch pipe, at the beginning to get the capacity for the extra distance.

THOS. DELWORTH: My experience with Skinner system of irrigation has been principally in greenhouse work, where I have found it very useful.

By means of my system as installed, I am watering a house 32 feet by 160 feet with two nozzle lines supplied with water by means of a small power pump of the buldozer type, operated by a two horse power gasoline engine, drawing the water from two wells about 200 feet apart and each about 27 feet deep.

With this outfit, we can obtain a pressure of 25 or 30 lbs. on the nozzle and can do in about 15 minutes work that would take two or three hours with a hose.

I have been using the system for nearly three years in growing lettuce and cucumbers and have never seen any bad results—in fact, for cucumber, I consider it ideal.

My greenhouse was planted with cucumbers in 1913. We made our first cutting on May 29th and the last on October 27th and had no difficulty in maintaining good growing conditions and a humid atmosphere in the hottest and driest weather.

As a means to prevent the attacks of Red Spider, I consider it very useful indeed, and, contrary to the opinion expressed by some growers at the time I installed it, my observations lead me to the conclusion that it does not hinder nor retard the pollenization of the blossoms in any way.

I would not be without it for three times its original cost.

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THE PRESIDENT: I am sure you are all pleased with the address. It touches one of the vital questions of the day, how to get moisture to the crop. Mr. Davis will always be glad to inform you on the matter. If you think of installing watering plant of any kind, write to him, and if you put "Davis the Celery or Lettuce man, London," he will get it.

REPORT ON CONVENTION OF THE AMERICAN GROWERS' ASSOCIATION.

C. W. BAKER, LONDON.

The President read the following report as delegate to the American Growers' Association at Toledo, Ohio, October 1st, 2nd, and 3rd, 1913:—

This Convention was largely attended by Vegetable Growers from 17 States; a good representation from Ontario, showing that we are wide awake and alive.

The Mayor of Toledo and President Bayer of Toledo Vegetable & Fruit Growers' Association gave addresses of welcome.

President Hall, of New Jersey, reviewed the past year's work and urged that the Association take up one or two lines of work this year, and devote all time and energy in that direction until real progress could be reported. A larger membership and a paid secretary to devote his entire time to the work of Vegetable Growers were essential.

The transportation question needed a strong representative to protect the shippers' side of the problem, and money is needed to present our case properly. We should have uniform laws covering weights and measures. Mr. Hall believed in the Association and its future.

The Committee on the President's address proposed that the Association through its Executive Board do all in its power to secure the enactment of a carefully prepared Federal law on weights and measures, used in Interstate trade and vegetables and small fruits to the end that weight instead of measure shall be the standard. The President also was authorized to appoint a committee on seed inspection. The time and place for the next meeting were not determined; among the cities which were suggested were Toronto and Philadelphia.

The resolution committee reported as follows:

Resolved, that the strength and influence of our National Organizations depend very largely upon mutual co-operation between it and various States and other local organizations of similar aims and objects;

Resolved, that a number of active standing committees on such questions as equitable transportation charges, official inspection of seed, grading and packing, naming of new strains and varieties, exhibits in connection with annual meetings, etc., be named at this meeting to make a full report at the next.

Resolved, that we respectfully urge our Colleges of Agriculture and Experiment stations to devote such means and efforts to the promotion and development of the vegetable growing interests as their importance justly demand.

Resolved, that we commend the action of the United States Postal Service in the establishment and enlargement of the parcels post which can scarcely fail to be of signal convenience to our vocation.

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The exhibit of material and supplies for market gardeners was an attractive feature of the Convention. These were placed in the small hall in which the Convention was held. The feature of the Exhibition was the operation of the Sam Mayer Vegetable Tier. This wonderful machine ties bunches of vegetables at great speed, and visitors to the Convention were so impressed with its possibilities that many placed orders for them.

Dwarf French Bean.

On the afternoon of October 2nd, the visitors were conveyed in automobiles on an inspection trip to the large greenhouse plants of the Growers. These houses covered from five to ten acres. The lettuce crop was just being planted.

At Miller Bros.' the Spalding tilling machine was on exhibit and doing actual work in preparing the soil for one of the houses. This machine cuts a furrow as deep as 16 or 18 inches, and not only thoroughly pulverizes the soil and prepares a splendid seed bed but mixes top soil and sub-soil together. The trip was very instructive to growers from other sections.

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DISEASES OF GREENHOUSE VEGETABLES.—Prof. A. D. SELBY, of Wooster, Ohio, said that greenhouse men had been solving their own problem by the use of steam sterilization. He urged greater care in the way of sanitation. Disease will carry from one crop to another.

The new trouble of tomatoes called collar-rot has done some damage. When the plants are attacked by the new form of disease the leaves do not grow to a normal width but are narrow and fernlike in appearance. Bordeaux spray at the base of the plant will prevent the spreading of this disease. To prevent trouble with outdoor tomatoes the growers should practice crop rotation. Lime and sulphur is satisfactory as a prevention of foliage trouble, except the downy mildew, for which Bordeaux should be used. It is too late to spray cucumbers with Bordeaux after the downy mildew has gained much headway. Prof. Selby said to change the soil in the greenhouse was like turning off a good workman.

Dr. W. A. ORTON, of Washington, D.C., spoke on RECENT PROGRESS IN THE CONTROL OF PLANT DISEASE. Spraying has become absolutely necessary to control celery rust in some places. When spraying has failed it has been due to bad methods of application. The spray should be applied with a pump of high pressure. Trouble has been experienced by some growers who have put heavy sprayed celery on certain markets. The health authorities have declared it dangerous, and have destroyed it in a few cases. The Department of Agriculture after a careful investigation has come to the conclusion that a person would have to eat at least 23 lbs. of celery at one time to get enough poison to even make him sick even if thoroughly covered with Bordeaux and it was unwashed when used. It will be seen by this that there is no possible chance of anyone being poisoned by eating sprayed celery.

A question was asked is there any use spraying celery after it has blighted? Dr. Orton said that if spraying is done as soon as blight first shows it will help, but after the blight is bad it is too late. President Hall told of an instance where the blight started on yellow celery first and that it was spread over the green celery by water. He will not risk the yellow celery again. He also told of an instance where the blight was bad, and that he took off all blighted leaves and sprayed with bordeaux and entirely checked the blight.

DR. FORBUSH, of Boston, in his address on THE VALUE OF BIRDS TO THE VEGETABLE GROWERS, said: Birds are great feeders, frequently eating their own weight in 12 hours. If men would eat in the same proportion they would devour 67½ feet of bologna each in 12 hours. He showed how simple bird-houses put up near the home will attract the birds. He thinks all birds but the English sparrow should be protected. A wren will destroy 1,000 insects a day. Meadow larks are worth $3 or $4 to a farmer as protection. Crows destroy white grubs and field mice. Martins catch cucumber beetles in large number. The Professor said he would not like to contemplate the result if all bird life should be destroyed.

PROF. PAUL WORK, of Cornell University, speaking on "LOCAL AND STATE ORGANIZATION," said that the vegetable industry is not going to decline, as the products are staples, and the demand for quality is on the increase. Local organizations should not tackle the hard problems at first; some of the things they can do or undertake are standardization of packages, transportation problems, control of legislation, local market problems, purchase supplies, and co-operative selling. The feeling of good fellowship will increase by organization. There were State Associations in Connecticut, Ontario and in New York. The work of selling co-operatively must be built from the ground up, the most successful selling groups are those that

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started small. We cannot get help from the Colleges unless we demand it. He said that we must have a saving faith to be entirely successful.

At Rochester, N.Y., the organization of market gardeners forced the city officials to give them reasonable prices on the market stalls.

In the formation of a local organization a failure means delayed progress for years. Many places are not ready for co-operative selling. Lack of confidence in leaders (sometimes justified) is one cause of failure of co-operative selling agencies; competition with outside buyers often causes trouble. If you cannot agree on some question drop it and take up another.

Prof. H. C. THOMPSON said that in a test the last season, where muck was used in various quantities from pure muck to 12½ per cent. muck in connection with ordinary garden soil in greenhouses, lettuce and cauliflower did best on the pure muck.

MR. DUNBAR said he found nothing as good to start plants in as muck, and recommended it wherever available.

A feature of the Convention was the readiness with which the members entered into discussion on the various addresses. Professor Rittenschamp suggested Toronto as the next meeting place. They had been talking about coming to Toronto for the Convention, but the next day they left it in abeyance. It seems to be between Toronto and Philadelphia.

W. J. KERR: I have had considerable correspondence in connection with the vegetable tying machine. The original patentee has leased the patents to a manufacturing concern in the United States. The Canadian patents are not leased to anybody as yet. I think the manufacturers for the American market have the privilege of selling in Canada. We tried to get them to exhibit one of theirs at the convention, but they would require to pay 33⅓ per cent. duty to bring the machine in. The original patentees have under consideration the advisability of getting the machines manufactured in Canada for the trade. We have given an estimate of the number of gardeners in the Dominion, and they are looking into the matter. If we cannot have it manufactured in Canada there is little hope of getting any of the machines for a little while. At the beginning of the correspondence they volunteered to send a machine free for testing, but they have not been able to spare one from their present orders. I am glad the President gave us a report, because we did not want to offer the members anything without knowing that it was really of value. I appreciate what you have said in connection with the hospitality shown by the Toledo growers, and if you attend any of our meetings at Ottawa we will display as much as you met with there. This is one of the things for which the Ottawa gardeners and housewives are famous, and the entertainments put up there for us, at the instance of the gardeners, are something we are very proud of. It would be a pleasure to us to have any member at any time, and we will impress you with the advisability of having the meetings.

PROF. A. H. MACLENNAN: At the convention in Toledo we tried to get a tier sent here with the intention of sending it around to the various branches. Probably a number of you are using the Saymer machine, made in Olinda. I bought one last summer hoping to get a mechanic to send it around the various sections, but unfortunately the sun got the better of me, and I was laid out for three or four weeks. The tying machine seems a good one. The bundle tier costs $90.

E. E. ADAMS: The machine manufactured at Olinda is for pulling weeds, and they must be a pretty fair size. They are pulled by a comb that catches and pulls them out. As manager of the Onion Growing Association, I know some-

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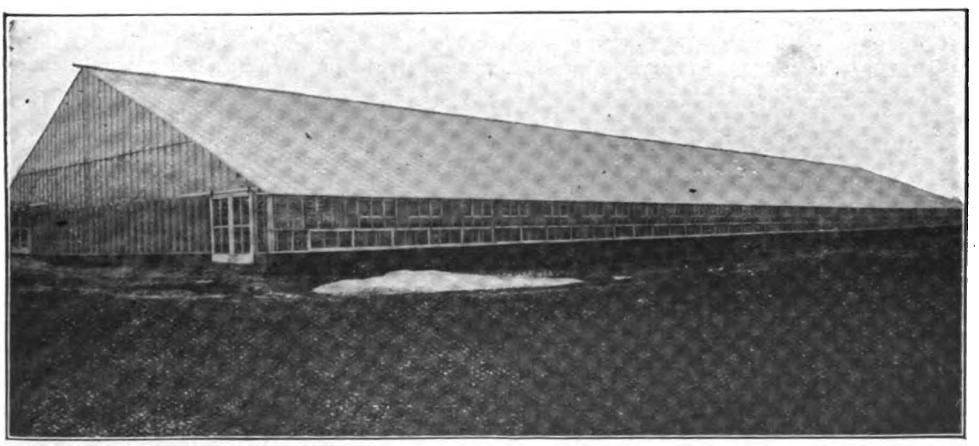
Ready for shipment.



Greenhouse, R. H. Ellis, Leamington, 86 ft. x 375 ft.

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thing about this. We have a machine that is being made at Painesville, O. It is pushed over a row of small onions one or one and a half inches high. It has a large wheel full of nails or something similar, and it revolves like a screw of a steamship. It catches along the row and does not pull out the onions, but pulls out the little weeds. We consider that the only machine. I could not recommend this from Olinda. The one made by the Secretary of our Association is the only one for weeding onions I know of.

PROF. MACLENNAN: I want to see the machine go round to the different branches. It costs $35, and you do not want to put that sum into a machine that you do not know anything about.

E. E. ADAMS: Our point is to take the weeds out away from the onions instead of allowing them to grow 1½ or 2 inches high.

PROF. MACLENNAN: I have been referring to clay soil, and for that reason I would like to see the two machines at work in the various soils.

HON. J. S. DUFF, MINISTER OF AGRICULTURE, was present at the Convention, and his remarks were appreciated by all present.

VALUE OF THE ASSOCIATION.

THE PRESIDENT: I have received a letter which reads as follows:

"I have just received a few copies of the Ontario Vegetable Growers' Association Report from the Department of Agriculture. I am interested in the growing of vegetables; next year I intend to market an acre of early tomatoes, and would grow winter vegetables, and onions, and radishes, could I find a market for them. I would very much like to find one through your Association, and if you would kindly inform me as to how that market could be secured I would be very much obliged."

I wrote giving him some advice, and received a card as follows:

"I have your letter of the 20th. I have lately become a member of the Ontario Vegetable Growers' Association. Any aid I can receive from the Association would come in very acceptably."

What are we to take from that letter? It means that this man heard that the Association was a live body, and men searching for new markets and new ideas of how to grow things are looking to us. They write to the Department and get the reports printed for our benefit, and for that of the people all over the Province, and this man wanted to get in, and he is now one of us and will, doubtless, prove an active member.

THE AMERICAN CONVENTION.

A MEMBER: The President spoke of having attended the Toledo Convention, and mentioned that Philadelphia and Toronto were suggested as the next place of meeting. I move that the President and Secretary invite the American Association to hold their convention in Toronto next year.

THE PRESIDENT: If we invite our friends here, we have to consider how we will entertain them.

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J. LOCKIE WILSON: The City of Toronto was always anxious to have conventions come here. It is an advertisement for the city, and a good thing to bring strangers within the gates. I do not think there would be any difficulty in securing one of the rooms in the City Hall for their convention. I know a number are being held there, and perhaps if we could get in touch—the President and myself I mean—with the officers of the City Hall, and then tell our friends that the hall will be provided free of charge, it might be an inducement for them to come. As far as entertainments are concerned I fear that we are scarcely in a position to do very much along that line, that is by way of expensive entertainments. Our time is limited, but we can interview the authorities and find out, first of all, if we can secure comfortable quarters for the convention in the City Hall, and we shall have something to offer. If we invite them to come as guests, we should be prepared to entertain our guests. If you will place the matter in my hands I will see Mayor Hocken, and if we can secure the Hall, we can couple with the invitation the statement that the Mayor has kindly granted a room in the City Hall for the Convention, and that we will be pleased to have them visit the city.

J. J. DAVIS: These things, if not done right, are very poor affairs. A body of men coming here from their own country would expect something in the way of entertainment; to be shown round, and perhaps have a banquet. We are not in a situation to do that, and we should let it stand until we are, for our own credit.

W. G. KERR: We are safe in leaving that in the hands of the executive. I do not know anything they have done in the past that has not had the sanction of the members at large. I move that we leave the matter in the hands of the executive to deal with in such a way as they think fit.

The motion was adopted.

THE PRESIDENT: They held a big banquet in Toledo, but each man put his hand in his pocket and paid for it. There is no expense incurred in that way, and the only expense, perhaps, would be taking them round the city by street cars or automobiles.

PROF. MACLENNAN: The Association should send letters of regret to Mr. Thomas Delworth and Mr. Joseph Rush, regretting their absence.

J. LOCKIE WILSON: No man has done more work for the Association than Mr. Delworth. He has been a patient, earnest worker, faithful at all times and ready to do his part.

The suggestion was adopted.

THE TRANSPORTATION PROBLEM.

ROBERT THOMPSON, ST. CATHARINES.

I do not know definitely what your problems and difficulties are; whether they are the same as the fruit men have. It would be best if the subject could take the form of questions and answers so that we could find out your difficulties. I am willing to give you any pointers about anything we have learned and secured in our district with regard to transportation. There are a few points that I might refer to before we start the questions that apply to the transportation end of the business. First, the greatest problems of to-day among the growers of vegetables is the introducing of their products into new markets. We have in the past been dealing

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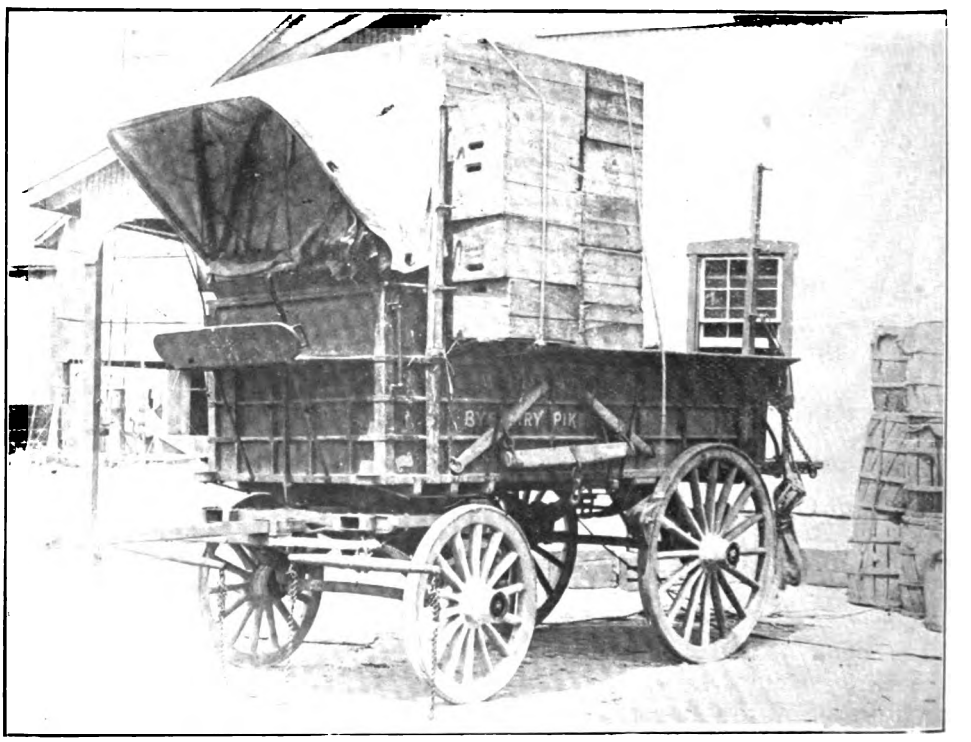
Jacques Cartier Market, Montreal.



Vegetable Market Wagon, as used in New Jersey.

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chiefly with the growing of crops, and fighting diseases, growing the best and the largest quantity per acre, and if in the past we have sometimes read some of the wild stories of great yields from fruit or vegetables they looked as if they were very much overdrawn. But when we got down to actual facts as to what was grown on the acres no story has been told that has been overdrawn, because we have at the present time any number of growers who are producing large quantities of the very best in whatever line they are in. Now it is a question as to the transportation of those products. To-day we as fruit growers had our own difficulties to face, and some were in a very pessimistic mood. One thought that we were at the top of our production of apples, and that we ought to curtail it, and at the top of the production of peaches and some small fruit. That does not agree with the opinion of some of the older men, and who have seen times of low prices; and it did not take very long, sometimes only two years before we headed the top again. Some of us feel, and I am among the number, that you must take into consideration not only suitable land and suitable locations, but shipping facilities as well. If all of those are available I do not believe we can overproduce. In this Province of Ontario we have a market for all we can grow, but we have to get after the market in a business-like way. One of the questions is the transportation problem. If the growers in any section think they can continue in the old way to put up the products when they run into tons, and double and quadruple the acres as we are doing, they are wrong. It may seem foolish for a man in the business, who loves it, to increase his acreage, and pile additional work upon himself with the help problem, still we do it and it pays, but if we continue in the old way of shipping by express in small lots here and there all over the province, splitting up our shipments, and, in the case of Toronto, sending to three or four commission men instead of one, we will always have difficulty with our transportation. It cannot be handled in that way. I say that advisedly, because I see the distribution and loading of the product of 600 acres at our siding for our company. Some think that when they divide up they are going to get a fair average. They think when they send to several men in a place they will get an average by setting one against the other. We have had that difficulty in our fruit for a great many years and we decided it was foolish to split up shipments and send to a dozen places when one would give on the average as good results. You can take the same interpretation in regard to vegetables as to fruits. If we find that for certain lines of fruit and vegetables certain varieties take better than others we will pick out good men, and load up all that they can take care of, and send it out by freight instead of by express. It will go a good deal better, a good deal cheaper, and give better satisfaction to ourselves and to the men at the other end. Take Toronto, Montreal, London and Winnipeg markets. Those are four of the leading ones. I am not speaking of Ottawa, because we leave that to the Grimsby men, because there is enough there to supply it. At the end of the year we find that there is not much difference between any of them. They will average up about the same. Now, if we can lessen our expense, lessen the waste by broken packages, between express and freight, and the expense of our own time, we can make money by keeping to the lesser number of shipments. I feel to-day that our greatest problem is not to look for express service alone. A good many of our fruit men are still continually looking for lower express rates to different points. After this season's experience, particularly when we handled a good deal, or sold a good deal more than usual, we went after the heavy end this year and almost doubled our sales, because we

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assembled cars for growers and put a manifest in the car, giving them the benefit of the lower rates. It is forwarded to one man who divided it between different people and he gets the benefit of car load rates.

We are responsible to the growers, and, naturally, we see that the fruit is put in properly. If one of our men happens to throw a basket, and it drops hard he is brought to task quickly. You cannot do that with an express or freight man. We count upon what we can sell and put into special markets. A compilation was made of the number of packages of fruit and vegetables shipped between east and west. I thought from my experience during the summer that we had sent out a great quantity. When I put them together I was surprised that they did not amount to one-fifth of what our total car numbers had come to. A large number of the shipments were in from one to three ton lots. That is the lowest we can put in a car. If we had divided it into express lots we could have cut it down one-tenth, with the same amount of work. In regard to three to five ton lots, our largest increase was in that. Our growers know fairly well about prices, and after they get their statements are more than satisfied because we have not any claims for broken packages and broken baskets, practically no claims for anything at all. Even the year when the packages were poor—owing to our basket men not having a supply on hand owing to the winter and not getting the timber out, and owing to crop being larger—notwithstanding all that, and the fact that every shipment that went out by express had broken packages. when they went into the cars by freight although the package might be broken or the end loose, when they went to the consignee, he was the unloader, and he did not loose any broken packages. That is very pleasant when one is shipping baskets, and the same thing would apply to vegetables.

Some of you may say you are situated where you cannot make up three or five ton lots. You may be catering to a market that cannot take that amount. That is where we would get together as growers, talk the matter over, and get in touch with our railway companies, because a railway represents both freight and express. If they divide up this service and give us an express service, taking in all of the smaller towns, then a special freight service from the more central points where the larger quantities are grown, where we can make up those quantities quickly, maybe once, or twice or three times a week, and pick out points that can take that quantity, and give us that fast service to those points—then you are going to get rid of a large quantity of goods, get better prices, and have less waste, and less labor. This year we shipped to a number of points. London is one. One of our growers got rid of from two to three cars a week at good prices. Brampton would take a portion of a car three times a week and Lindsay twice a week. Peterboro would take a car. You cannot hope to supply everyone in the place, but they would take part of a car twice a week. Also Oshawa and other little points. If I want to make a shipment from St. Catharines to Oshawa by express it had to be on the platform by 12 o'clock to 12.30 p.m., not later. They had to be ready to leave the orchard at 10 a.m. They were thrown in in any shape, or every way. They would be pitched up in the car and let fall; piled up ten high; piled up in smaller piles and when the train started they fall over. They cannot help but do that; those baskets when they get to the other end are broken, and there is trouble. Then the grower will receive word that so many are broken, so many are pilfered, and you cannot state which. I have heard the expressmen say that they considered that they ought to have a basket every day anyway. Now, we do not want to take the larger points and bother

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with the small shipments, we had better make up the larger ones. That went out by 1 o'clock. Going by express it would reach Oshawa next day about noon or 11.30 o'clock. A shipment of from three to five tons could be put in a freight car for Oshawa leaving St. Catharines at 6 o'clock and it would be there before noon next day, and the shipment would be perfectly satisfactory. We want a special freight service, putting on two special freights for us, starting at the Junction and going from Queenston to carry the fruit through there. A special was put on first, and then a second. Those specials can take the fruit in part of carload lots and can make good time to certain points in Ontario. For instance, if you wanted to ship into the northwestern district of Ontario or to Huron or

Grown in greenhouse for early market.

to Goderich or Owen Sound, we would load a car round here for those points. Nothing would be put in this side of St. Thomas. They may take a different route this year, but that one worked. It would be in Palmerston next morning. The shipments were taken out of one car and divided over five lines from there, and went out that day reaching their destination the following afternoon, sometimes some of them in the morning. That is good for the railway men and good for us. If we wanted to divide up for points north we divide at London for Toronto to Belleville. That is the division, and from Belleville to Brockville is another. Kingston is a heavy point, and we could load heavily for there. It would be put in the centre of the car, and it would be manifested to Kingston. It would be down the next morning before the way freight would pass Kingston. The fruit in those two cars was put in for each freight going either way, and

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would be landed the day following the evening of shipment. The time of shipment should be pretty well towards evening, if we could work it so that it could be done, because it breaks up the day to go in the middle, and gives us a day to get it ready. It is a good time to load because it is cooler at night and it is landed next day; that is express service at less than half cost and no waste. If we could have a freight service of that kind and express service that would take in the smaller points and smaller shipments from our men in the larger sections we would be all better off, and help to solve the problem for the railway men. They would agree with us, but we would have to get together and be ready to fulfil what we promise to do. The trouble with the railway men is that when we say we are going to do certain things, they know almost as well as we do, that we do not always make good what we say in regard to shipments. We think in the early part of the year we are going to ship so much to a certain point, and when the market goes bad and we quit there is no more fruit sent there. Or, again, when we are going to load for certain points, unless there was something definite, there would not be enough in the car for the railway to take it up. We would have to make good what we promised. The railway men are willing to do pretty nearly what we want them to do, what is fairly reasonable, and we have to get after them in that way. That is the salvation of our growers, to get that freight service, larger quantities out into the towns and large villages; get to the people that are paying double prices, more than the produce is worth. Possibly it is not all the fault of the middleman. He may be only handling a few packages and is going to have a good lot of waste; whereas with a large quantity he can afford to sell at a great deal less profit per package. I could give instances of places where they took less than 100 packages at first and wanted 25c.; 30c.; and 40c. profit, and after it increased to thousands of packages they were satisfied with 5c., and better satisfied, as everything went off quickly and they made more money than they did before.

W. J. KERR: What about the packages? Improved packages might help in regard to breakages and pilferings.

ROBT. THOMPSON: Better packages certainly would help, but they will not help our fruit or even your vegetables. Take celery, take our boxes of peaches and apples; the packages are perfect but they throw them down, turn them wrong side up and bruise and crush them. The heavier the package the rougher it is handled. I do not want to get near the express company. My temper gets the best of me. What is the use of our handling our stuff carefully if the expressmen are going to toss it about and bruise it. The shipments should be handled just as carefully as eggs. Even potatoes should be the same, because throwing them around damages them. The expressmen are particularly careless. We cannot say so much about the freight men as they do not get the same chance. In the case of our own men we have them under control. I am well pleased that we have done so much this year. In one shipment, however, one of our men was to blame. He wanted to get away and stacked his load in fours, the car got a shunt and knocked over the baskets and several were broken. We did the best we could with them, picked them up, put them in the car, and even in that case we had no complaints. I expected a complaint but did not get one. The reason was, perhaps, not a shipment reached the consignee by express without some package being broken, and it would not matter so much. Another fact is that nine-tenths of our consumers are not prepared to pay very much more for the packages than they can help. They want a cheap one. We have tried putting

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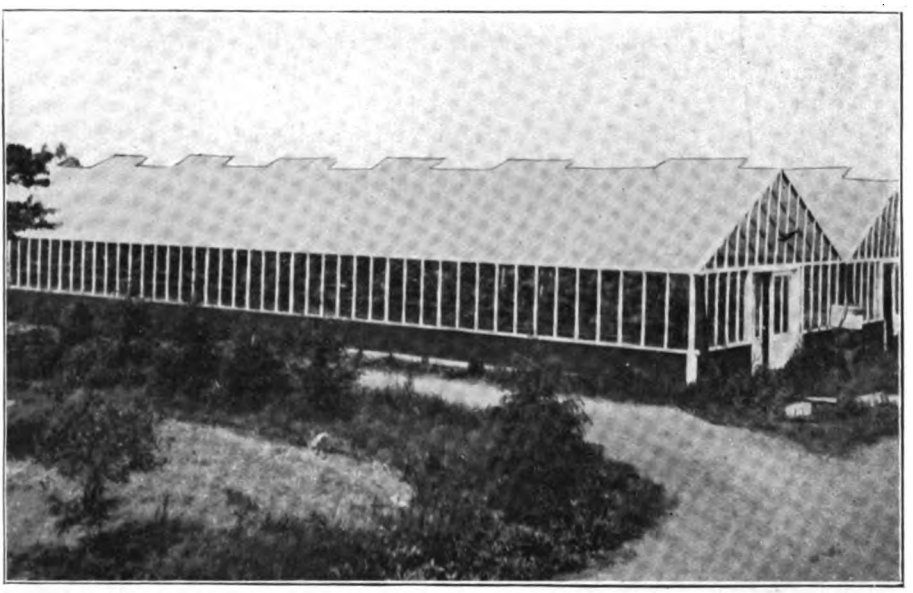
some of our tomatoes in a package costing 8c. or 10c. instead of 4c. or 5c. We got slightly more for it, but the public are not prepared to pay the difference. They need education, as well as railway men.

A MEMBER: Would it be worth while to have a man go with each carload, and take care of the fruit and vegetables?

ROBT. THOMPSON: If you ship by freight it is not necessary. If you ship by express you receive no consideration. I have gone to the station to look after shipments, and I have seen them turned upside down, yet I had no control over them in any way. The express men did not recognize my control at all. The railway company is responsible for damage by freight, and we get our damages from them. The only benefit you would have in sending a man would be in the distribution at the other end. This year some of our men shipped fruit to



A moneymaker for a vegetable grower.

Chatham and sold it out of the car. A grower can sell anywhere; a man who buys has to sell out of the car door. A large number were sent up in that way. At first there was a little opposition from grocers, but afterwards they came and bought the same as others, receiving some concession. You know that the marketing end is pretty expensive when you have to sell at local markets or divide into small lots. If you can get the larger quantity, not necessarily a car load, the railway companies will take three or four tons over a short distance. Now, that is where co-operation comes in, and your advantage of location together with the spirit of co-operation is where growers working along the same lines come in. They could load together. At St. Catharines we use to, if we saw Tom Jones shipping a lot of peaches to Kingston, or London, say we had better keep out. We did not think that all along the line others were shipping where we were going to ship, and that it was only a question of saving expense. If we could put our fruit in there as we started to do for less than half the cost it did not make any difference whether the other fellows went or not. We have drifted into large shipments, keeping out of the express. Ours is one of the poorest

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points for the express company in the Niagara district. We will have to face this difficulty. When we start to advocate rates and advantages for certain points where there are only small shipments, you must remember there is no quantity to get the rate. When going to buy a farm, a location for fruit or vegetables, I look first of all at the location; first drainage and the advantages of getting to a shipping point. If it is off to the one side where there are no advantages, the farm is not worth nearly so much as where the owner has good transportation facilities. If there are enough growers in time to make up a car load they will get the advantage of central gathering points; but it is uphill work, because they cannot get the same service, and consideration, and they cannot expect every train to stop. That is where our freight express would come in. The growers in the larger points would give up the express to the smaller places, leaving that to the growers in the smaller places. They would get higher prices, and could handle smaller shipments, that would be a matter of co-operation.

A MEMBER: When you ship four or five ton lots do you get the same rate as in the case of a carload?

ROBT. THOMPSON: No, we have through rates. The rate to Toronto on three ton lots is 24c., five tons 21c., and carload lots 15c.; the express is 40c. In some places where they could not make up a carload we found that we got a lot of fruit and vegetables worked off to go in three to five ton lots to little places.

J. LOCKIE WILSON: Neatness of the package and the grading of the vegetables, so far as color and size is concerned is very important. I have seen good vegetables put into ugly, unsightly baskets or boxes, and they would not bring as good a price as fruit or vegetables a little inferior, but put up neatly and properly graded.

ROBT. THOMPSON: Dirty, unsightly boxes or packages should not be used at all. We had some this year that were not so strongly made as they should have been. Even at best they are none too strong, and sometimes not made as smooth as they might be.

W. J. KERR: Down in the city, Spy apples are selling at $4.50 retail; in another city I saw Idaho apples selling for $6 per barrel that I could not eat. I attribute that largely to the packing.

ROBT. THOMPSON: When I say packages I mean baskets, or the ordinary boxes. A barrel of apples and a box are two different things. Up to a few years ago not many people bothered about the boxed packages and not many of the consumers were prepared to pay the difference. I say that advisedly.

W. J. KERR: How much difference is there?

ROBT. THOMPSON: The difference is this, that our papers and our people that come from the West talk about Western apples, about what they can do there, and insinuate that our people here cannot grow as good fruit. I say anyone can walk down to the transportation building and see 300 box lots of apples, excellent, without exception. I have seen western apples, and have studied that question, and these apples from Ontario will compete with the world. They are altogether better than the western apples. They will sell when the people know the difference, but they have been educated that the apples are not so good here. You see it in the papers time and again, but it is a fact that our peaches in Ontario sold in the last three years from 20c. to 25c. a box better than the western and Californian peaches, so it is time for the Ontario people and papers at least to say a good word for Ontario fruit and the people who are trying to put it into packages. Then we will get more for fruit and vegetables put in special packages. But when we

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put up those in baskets costing only 4c. or 5c., and sell them for just the same money as special packages it is not encouraging for us to put good fruit in good packages. Until the people are ready to pay the price we have to make the best of the cheaper box. I told a manufacturer we wanted a hardwood cover and to have four hooks instead of two. One man put four and sometimes six, and he hardly ever loses a package through bad order. It does not take much longer to put the extra two hooks in. Another point is that our men taking them out do not stop to look if the basket is perfect, they put the stuff in and expect that it will go through in good shape. They go through without much loss, but the shippers are contributing towards the bad carrying when they do not fix the tops. The man who looks after that gets paid to a certain extent, but not to the full extent as compared with the man who is careless. The receiver will average it, and the well-made package will pay the loss on the other. In vegetables I cannot say anything about packages. I see many of them coming into Toronto without covers. At certain times of the year that will pay, but in seven-tenths of the shipments it will not. It pays to put a cover on every time.

MARKETING VEGETABLES.

E. E. Adams, Leamington.

Some years ago it was the rule to ship some kinds of vegetables in barrels, hogsheads, boxes, or other packages. There has come a change. To-day we find many varieties of vegetables in packages of various kinds, attractively labelled and containing a definite amount of some varied commodity.

Things have changed with men's ideas. The marketing of many kinds of horticultural products has followed somewhat closely along commercial lines. Packages vary little now as more advanced ideas have brought out a new system, whereby more standard packages are used. These have proved very advantageous. It is rather confusing to have a large number of packages and as many different prices attached to them. We find some markets quote some lines of vegetables at so much per strap, so much per box, so much per hamper, and many other ways, which causes considerable confusion, but from the leading shipping centres now we find celery in cases of four to six dozen, tomatoes in four basket carriers, and some in six basket carriers, cucumbers in what are called half-barrel hampers, lettuce the same, potatoes in barrels containing 165 pounds and so on. These packages being standard, buyers know what to expect when a quotation is given.

Use a Good Brand: Some growers or shippers are using a brand or trade mark to distinguish the quality of the goods which they market, and much to their advantage, as buyers soon recognize an honest brand and ask for it on the market. A brand should include the name and address of the grower or shipper, as also the variety of contents of the package.

Much of the fruit and vegetable products are sent to market to some commission house to be sold for the best price obtainable on a basis of 10 per cent. commission. This at times is a very satisfactory method, but it is not always the best. In the marketing of perishable stuff, we must do the best thing possible in order to avoid loss, and as commission merchants have usually a large trade to cater to, their services are very necessary to assist distribution, although some think otherwise.

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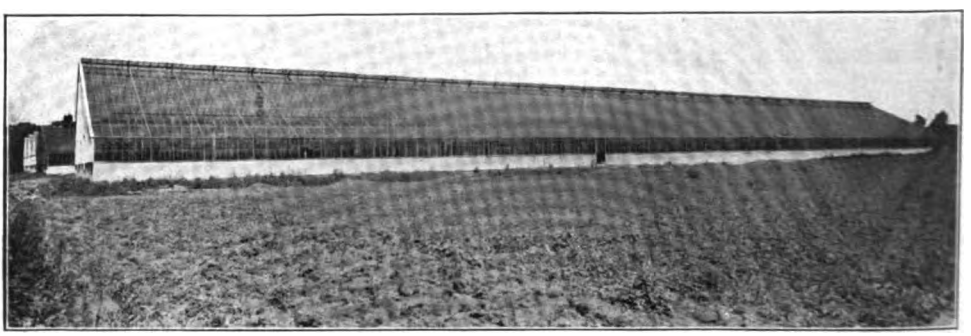
For shipping hot house tomatoes we are using boxes measuring six by nine by nineteen inches and containing 20 pounds. These are all wrapped in tissue paper with the grower's name, and the box has a lithographed label on one end, and each end has a thin band of sheet iron nailed around it for security. These boxes are made of pine one-quarter of an inch thick and planed on one side. We also ure corrugated paper all around the inside of the boxes as protection to the fruit.

Well-cultivated Cabbage Field.

For hot house cucumbers we use the eleven quart basket, with a label pasted on the top before covers are made up.

PACKAGES USED: Lettuce is shipped in boxes and barrels, asparagus in eleven quart baskets, radishes in boxes, cabbages in bushel baskets, wax beans, field grown tomatoes, peppers and egg plant in the eleven quart baskets. Canteloupes are shipped in bushel crates and baskets, also in eleven and sixteen quart baskets.

Close attention is given to careful growing, packing and shipping. Every order received each day up to five o'clock is shipped promptly. Promptness in filling orders is to be regarded as one of the great essentials to success.



Iron Frame House, 375 ft. long.

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CO-OPERATION IN PURCHASE OF SUPPLIES AND SALE OF PRODUCTS.

W. J. KERR, WOODROFFE.

The growers are co-operating and working together, but the householders are not, and we have found that when expenses and difficulties are placed on the producer it is added to the cost of the product. When you see fit to impose restrictions on any producer the consumer pays for the restriction every time. The sooner the people of your city and others recognize that fact, and remove those restrictions and provide some means for getting both producer and consumer together the better it will be for the consumer at least. A previous speaker referred to the fact that it was time that the producer in Ontario should advertise his products. The western man learned that long ago. That is perhaps due to the fact that it is a windy country. That has evidently made some of them windy also.

We have the means in our power of finding the standing of these people, and they are selling hundreds and thousands of pounds. We are getting the same thing at the same price and offering it to you. In relation to our Association it does not mean that our Secretary, or President, or Purchasing Agent, or all three should do everything, while the other members peacefully look on. It should mean that all our members should work diligently together for the welfare of our Association.

At the outset, is the work of the Ontario Vegetable Growers' Association worthy of the hearty co-operation of all our members? When we look back over the history of vegetable growing in this province, and note the advancement that has been made in our business within the last few years, we will all agree that the work done by our worthy officers of the past, supported by the rank and file of our membership, deserves the best thought and support we all can give the Association in the future.

I believe it is the wish of all our workers that our business, the first business of man, should be honored by the work of intelligent and skillful men and women, that it should be one of the most respected businesses in our pleasant land. In order to attain this happy state in all its glory, it is necessary for us to co-operate, one with another, in all our undertakings, to educate our brothers in the best methods, best varieties, best machinery, best mode of marketing, etc. We must also not lose sight of the great necessity of making it a pleasant business, and we must endeavor to make it attractive to our sons and daughters, so that it will be honored by them after we are gone.

We cannot make it attractive to our young folk, by compelling them to work long, weary hours incessantly, without a chance for recreation and pleasure. I have in mind a prominent member of our Association who has learned the most valuable lesson of interesting his boys in his business, and he has the assistance, the co-operation of three of the best helpers I ever saw. Here we find co-operation in all its glory. The young men are equally interested with their parents in the success of the business. These young men find delight in the pleasant business that furnishes them a profitable livelihood. On the other hand, my mind turns to another member, who persists in being the boss in capital letters, his boys are permitted to work as uninterestedly as they may, with no interest in their work, because their father does not seek their co-operation in interest and judgement. The boys have no say in the business, nor are they paid in cash for any work, and

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A heavy crop.

as fast as these boys reach the independent age they abandon gardening for other pursuits, which while less profitable, often, there is in it offered change and independent revenue. I will remember a family of my early acquaintance, the head of which did not believe in family co-operation. If his good wife presumed to offer any opinions conflicting with his ideas, she was likely to be dragged around the house by her hair for awhile. If a young member of the family dared presume to have any opinion of his own, he was likely to have his foolish ideas knocked out of him with a stick or club. Needless to say, there was neither a high sample of happiness nor prosperity in this household.

If the vegetable growers of this Province will get the best out of life, and out of their business, they must co-operate in a different spirit. He that "hideth his light under a bushel" misses all the best of life. And it is surely true, that he who does most for his neighbor's good, gets most of the good himself. By co-operation the labor trades have in many instances, succeeded in boosting the price of their labor, and at the same time, knocking the quality of it down, till the employers of that labor, in order to reap any profit out of their business, have been compelled to increase the price of their products till we hear the wail of the consumer all over the land. In my humble opinion this kind of co-operation has not been for the country's good. While I believe in fair remuneration for all labor, I believe in fair labor for all remuneration, and those of us who are compelled to engage a quantity of hired help now-a-days, know what we are up against.

The trades and professions are all organized, even the tramps. These latter know on their first trip through a district whether each farmer has a

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cross dog, a cross or charitably dispositioned wife. The cultivator of the soil is about the only class that does not co-operate. Shall we say he is ignorant, has less interest in his own and family's welfare than the members of other professions? At any rate we know he bears the recompense of his lack of co-operative spirit.

In the case of the gardener, his lack of co-operation and the co-operation of the professions that supply his requirements, make him pay double for his tools what they cost to manufacture.

Co-operation of manufacturers prevents any gardener in Ontario getting any Planet Junior tool except it comes through their distributing agent, and then through the hands of the retailer, greatly adding to its cost. Co-operation of the seed dealers of the province made gardeners pay $1.75 cents per lb. for carrot seed that this year by co-operation you are enabled to buy from the most reliable growers, all fresh 1913 crop seed, for 45 cents. Co-operation of the seed dealers made you pay last year, such figures as $1.75 per lb. for beet seed which is offered you in our co-operative purchasing plan for 30 cents, $2.80 per lb. for cabbage seed offered you this year for 75 cents, $2.35 per oz. for cauliflower seed offered you this year for 75 cents.

Since you decided to buy your seeds co-operatively, your purchasing agent has been flooded with catalogues and price lists and special quotations from seed growers from Denmark, Germany, England and France as well as from the United States. The manufacturers of many of the supplies we use have written us soliciting our orders in their respective lines. The publication last spring in one of the European trade papers of our co-operative movement brought immediate solicitations from a large number of concerns producing supplies we use.

Co-operation of the seed dealers blocked our business with Hjalmar Hartman & Co. of Copenhagen, Denmark, and with the Henry Mette Co. of Quedlinburg, Germany, but our determination to resist this illegal and unwarranted interference with our just rights has brought a request from both of these firms for a renewal of our patronage.

Co-operation of the seed dealers prevented a prominent member of one of the largest and most reliable of the European seed growers meeting me in our city last summer, he fearing his customers, the seed merchants, might learn of the meeting, and his firm be immediately blacklisted by the seed trade. We met in a strange city and went into our affairs thoroughly, with the result that on our positive promise to jealously guard their name in the deal, we are offered supplies of their high grade seeds, and I learned many secrets of the inside workings of the Association that appears to believe they have a "Divine Right" to our trade.

Some of you will remember the letter in the *Globe* last winter, purporting to be an interview with the head of a prominent seed concern, in which he gave as a reason why we got seed so much below their prices, that we bought cheap German seed. If he and the members of the Association to which he belongs, do not buy this same "cheap German seed" why do the growers of it fear their boycott? Why did they return our orders to this Canadian dealer last winter, requesting us to buy from them "their very large and important customers"?

The report of our co-operative movement brought from the United States to a meeting of our members, a grower of onion seed which we have tested this past summer with very satisfactory results. He offers us his seed grown with the greatest care in a climate whence comes much of our most satisfactory seed. The samples you see before you are of the type he produces, and by using his seed on good ground, well worked, and sown thick enough, you may expect to produce this type of crop.

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By means of our co-operative movement we are able to get much better quotations on fruit boxes and baskets, fertilizers, spray materials, fencing, sleighs, cutters, etc., than we could get individually.

I most earnestly solicit your hearty co-operation in this matter and promise you in return my services in getting you the very best than can be obtained, at prices that you were never able to buy at before.

But co-operation should not stop at the purchasing of necessities. Co-operation in the sale of products is just as important.

We hear much of late about the profitable prices and ready sale obtained by co-operative Apple Associations, while non-members have had difficulty selling at any price, and last year many thousands of barrels of the finest apples in the world rotted in Ontario orchards while fruit of very inferior quality from Idaho, Oregon and Washington sold for fancy prices in our cities, because of the co-operation of the growers in packing and marketing their products.

I have for a few years had a scheme which I hope to see the members carry out, and which I give you for your consideration, and I hope in the not distant future some similar arrangement will be arrived at, by which our products are placed in the consumer's hands as promptly as possible, and at the least possible cost. We estimate the number of gardeners who sell their produce on the Ottawa market at about 100.

To sell a load of say $3,000 worth of produce the average gardener spends from very early morning, often from two to four in the morning till noon and after. The time of himself and a horse or two is given for that length of time. In other words, it takes 900 hours, 90 reasonably long days, or three months and a half to sell $3,000 worth of produce. Then if we estimate the loss sustained by the long absence from home caused by the idleness of hired help while the boss is away, it is a very serious matter.

I hope to see established in a central locality in our city a large depot, to which the gardeners may bring their goods, receiving a credit check at time of delivery, crediting him with the quantity and quality of his goods. A wholesale and retail business may be done here, under the management of a competent and skilful business manager, who should be capable of so advertising the merits of fresh vegetables as an article of diet that it would greatly increase the consumption of our goods, much to the benefit of the consumers.

In this way we can prevent the glutting of the market with goods by having the surplus shipped to markets where scarcity prevails, and if we have a shortage in any line we may help dispose of the surplus products of our brothers in other districts. My judgment teaches me that we could market our goods in this way with very much less expense, and avoid gluts and unprofitable prices we now sometimes have to face. Our consumers would get their supplies in better condition than they sometimes do, and consumption would be greatly increased.

In conclusion, I consider it my duty to my family, and to my fellow man, to foster the spirit of fellowship and co-operation in every possible way, looking forward to the time when the cultivator of the soil, the producer of the nation's food supply, shall be respected and honored as the importance of his profession deserve.

Let us unite in this most promising movement, each extending a helping hand to his brother at every opportunity. Let us bury our feelings of petty jealousy and selfishness, which cause untold heartaches and sorrow in the world. He that lives for self alone, knows naught of the world's greatest happiness.

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Let us keep always in mind the old story of the bundle of sticks, which bound together could not be broken. If we wish to preserve ourselves against the wiles of other professions and get out of our labor what we deserve, we must stand shoulder to shoulder, forgetting self, in the contest for the general good of our business.

Let us in every possible way foster the co-operative spirit in our families, in our Branch Associations, and in the larger organization the Ontario Vegetable Growers' Association. Let us give to our worthy Secretary, who has so faithfully served us, our most hearty and sympathetic support, and out of these little duties performed, will grow a prosperity and enlightenment that will make our chosen profession one of the happiest and most acceptable in our fair land.

THE PRESIDENT: Are we going to put our strength into this movement. We can buy, collectively, cheaper than in any other way.

COLIN MCNICHOL: We ought to support Mr. Kerr in this movement. I represent Stratford as secretary, and last year I bought some seeds and sold them to members of the branch at cost. We saved money and secured a better quality of seed. We cannot do better than support Mr. Kerr fully and send him our orders. Not only give him a little just to try, but a full order for the seeds you require.

J. J. DAVIS: We cannot do better than by giving orders to Mr. Kerr, who gives as good as we can get anywhere else at a good deal less price. We started a branch in London, and we ought to back Mr. Kerr all we possibly can as he is going on the right track. We will save money, and it will help encourage others, which is one of the strongest inducements to secure members. They can buy cheaper as members of the association than if they are not, and it is the most effective argument to use upon them.

W. J. KERR: With regard to terms, the seed dealer sells to the planter on terms of September 1st. It is an advantage to many, but not to all, and most of the growers are quite able to pay for the stuff when they get it, so long as they know what it is worth. If you will give me 75 per cent of the profits I will wait for you as long as you want to wait, but when we do our business in such a way that the profit is smaller than you pay your help in the field the matter is different. A man wrote and asked me if I would get him 100 lbs. of mangel seed. I consented, if he sent me a bank reference. The manager wrote me and said the man was financially responsible, and had a fairly good amount to his credit, and was known to pay his accounts promptly. I sent to Germany, bought the seed and paid for it. It came out. We paid freight—there was no duty—and sent it by express from Ottawa, referring the account and expecting prompt payment. After waiting some little time I drew on him through the bank, attaching his account. It was returned over his signature—"I never gave any such order to anybody." That was as much as to say I was drawing on people when I was not justified. I demanded an explanation. He wrote back, and said the parties he had bought the seed for had bought it already when it arrived. This arrived in April, and the least that he might have done was to notify me. I am not going to be caught that way any more. We cannot afford it; so we have refused the order of one of the most prominent of our members. He did not ask for credit, but he sent a large order. I sent back his order, and drew attention to the paragraph on the second page. We cannot make any exception for anyone, but I have as much faith in his order as in the Bank of Montreal. If we lose on one or two of our members we do lose, and I cannot afford to work for nothing. If you want credit pay me from 200 to 1,000 per cent profit, and I will give you all the credit you want.

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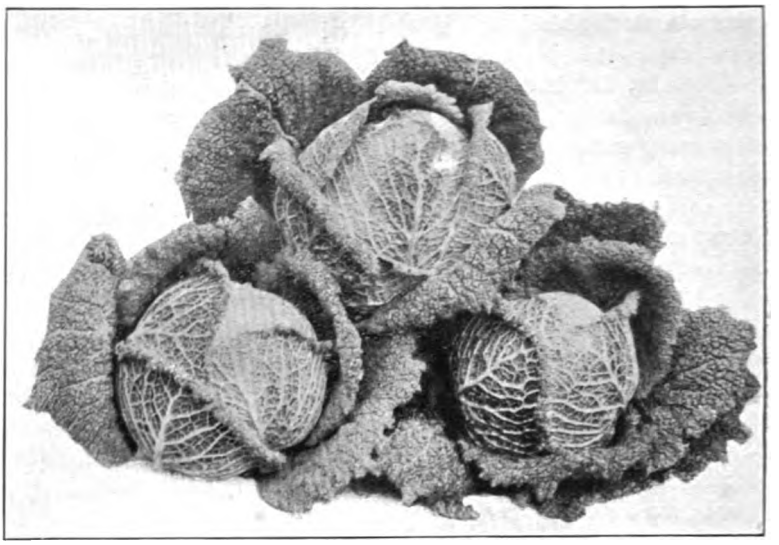
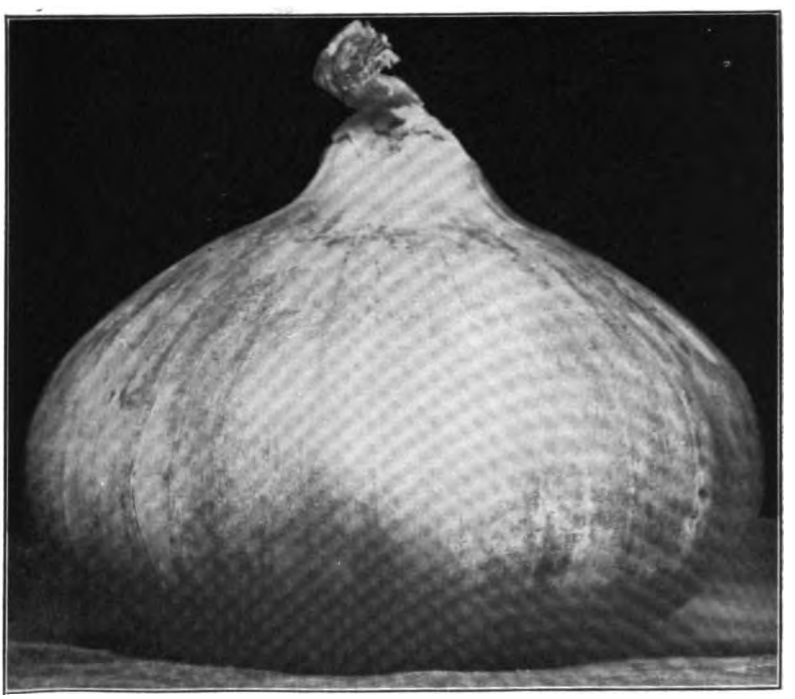


Green Savoy Cabbage.



Prize Yellow Rocca Onion.

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F. F. REEVES: When this matter was brought before the executive the instructions to Mr. Kerr were very plain. He was to give absolutely no credit. I am glad to hear that he has lived up to them. With regard to co-operation we had a little experience of it here in Toronto. About sixteen years ago we decided that we were paying too much for our seed. We did not buy direct from the grower, but we got our orders in a lump and sent out figures to the different seed firms. They gave us prices, and in some instances cut the price in half. We would have followed that along, but we gave credit and two-thirds of our members did not pay. Others had to pay for them, but we bought our seeds that year and a good many years after at something less than before. I hope that every member of the association will do his best to help this movement along. We have everything to gain and nothing to lose.

Mr. J. LOCKIE WILSON: We are all honest men in the Association—as honest as the average—but we have some men who are not quite so prompt as they should be. You know that we have one member in the Association who got $14 worth of potatoes from you. I have written him six letters, and I cannot get an answer. Another owes $17, and I cannot get any answer from him. In the case of Mr. Kerr, he would have to pay it out of his own pocket, because we cannot be responsible for the delinquencies of those who buy from Mr. Kerr. If we are going to succeed, let there be no twisting and swerving in this matter. We are trying to start a co-operative movement among the members of the Ontario Vegetable Growers' Association. If you fail now it is your own fault. You have an absolutely honorable man as purchasing agent. Mr. Kerr is an absolutely honest man. It is up to us to be honest to him, and a man who takes offence because his order is returned asking for the money is just as well out of the Association. Ten per cent. is all Mr. Kerr gets for his trouble. He cannot, and we cannot afford to have heavy losses. It is up to us to stand solidly by this movement. I am not going to say that he will not make mistakes. There will be errors made. Who is there here who does not make a mistake? On the whole your business will be conducted fairly and honestly, and it is up to you to say whether it will be a success or not. Looking at the faces of the members of the Association, I believe them to be honest, square, earnest and honorable men, endeavoring to work for the best interests of themselves, their families, and the Province of Ontario.

PROGRESSIVE VEGETABLE CULTURE.

S. C. JOHNSTON, B. S. A. TORONTO.

The progressive vegetable grower is looking for new and improved ideas regarding the growing of his products, and any method by which he can realize increased returns from his garden interests him. The following methods and appliances are being adopted by vegetable men in parts of the States and may prove of interest and value to Ontario growers.

From the greenhouse vegetable growers' standpoint let me say that sterilization of soil is being extensively carried on by practically all progressive growers. In some cases steam boilers are purchased for the sole purpose of treating the soil. Some are using the inverted pan method, others the spike method, and one progressive grower in Grand Rapids (Mr. Yonkers) has made a sterilizing apparatus which amounts to putting a modified Skinner irrigation line under the soil to a depth of

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four to six inches and forcing live steam through the nozzles. He claims to have better success from this method than any other employed. Sterilization will give results. This has been proved by many growers on the other side, and many make an annual practice of treating all soil in the greenhouse.

Some growers make a point of growing only one or two crops and making a specialty of those particular ones and improving as they can. They select their own seed and do their own crossbreeding and aim to supply the market with the best possible varieties of that particular vegetable that can be found. Some growers make a specialty of cucumbers, others tomatoes, and others lettuce, and during their season the quality of the produce from these specialists can be seen on the markets, realizing 10 and 15 per cent. more than that of any of their competitors. Improved varieties are due largely to selection of seed. These men do not depend on seedsmen for their seed, but at different times go through the growing crops themselves and pick out the best plants and select their specimens from these. The progressive grower knows what his market demands, and this is probably the main point on his score card for his selection of specimens for seed.

The large greenhouse plants around Toledo are devoted to extensive growing of cucumbers, and the growers have adopted a device for training their cucumbers. A stake one-half inch by one inch by seven feet in length is fitted with a simple nail lock, one nail being driven through and another somewhat longer being driven through the stake and bent so that it forms a lock with the other nail. The bottom of the stake is either driven into the ground beside the plant or is fitted with a small resting shoe, and stands on top of the ground beside the plant. The tops are let into a piece of ribbon wire which is permanently stretched through the houses. This wire holds the cucumbers solidly in place and excellent results are given. This wire may be procured through Bolswick, Braun & Co., Toledo.

Skinner irrigation has already been dealt with, but this cannot be spoken of too much. Growers in all sections are beginning to use this system on gardens from one acre to 40 acres in size with remarkable results and everywhere satisfied growers are the best answer to any question re Skinner irrigation.

It is the custom of some vegetable growers to hold their manure before applying it in the greenhouse. They have told me that they find this practice is worth considerable to them. Some of them have built concrete manure pits and they pile the manure to a depth of three or four feet in these pits and turn the water on to the manure at intervals to keep down the fire fanging. Some turn the manure at different times. These pits are built with concrete walls about one foot thick and eighteen inches to two feet high, and, as a rule, have paving brick laid in an inch or so of concrete for bottom. They are higher at the ends than at the centre, and are made wide enough to permit hauling manure right into them. Several growers are now making an annual practice of holding their manure four or five months in this way and advocate this method, especially for the manure that is to go into the greenhouse. All liquid manure is soaked up by the coarse manure in this way and full benefit is thus gained. Some growers make pits for this manure only, and build it entirely of concrete and do not drive in them, simply throwing the manure into a pile in them and watering as they see fit.

The R. & D. Co., of Penn Yan, New York, have a patented celery bleacher, which is being tried out by several growers. It consists of a strip of material very similar to some of the common ready roofings, 12 inches wide and in rolls of 100 feet in length. This is placed around the celery instead of boards or paper, and is

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held together by means of |—| shaped wire holders which fit over both sides of the paper. This method is not more than a year or so old, and it has been tested with some degree of success by some growers.

STAKING OF TOMATOES. Possibly this scheme is being tried out more than any other by progressive vegetable growers. Fully 50 per cent. of the growers visited this summer were either experimenting with it or were beyond that stage and carrying it on as part of their yearly work. There are different methods of staking employed, and as yet it is mainly the early varieties that are being staked and in quantities ranging from a few plants to one and a half to two acres. The commonest method is to drive a stake into the ground beside the plant and tie the plant to it with either twine or raffia. Stakes are of one and one-half inch material, and

Modified Pipe Frame.

made from five to seven feet in length. Plants are set eighteen to twenty inches apart in the rows and three to four feet between rows. The vines are trimmed to one stem. Growers claim they get earlier fruit by nearly a week, and that the quality of the fruit is improved. The estimated cost of staking plants is between five and ten cents per plant.

F. G. W. PATTISON: In my experience, the quality of tomatoes on stakes is mostly better than that of those on the ground. They ripened to perfection, and there was not a single imperfect specimen up to the 15th of November this year. They lasted from July to November, the quality was better, and the yield larger, the results in the garden being magnificent.

A MEMBER: What kind of stakes were they?

THE PRESIDENT: In Toledo they were about five feet long.

A. H. MACLENNAN: Three or four years ago we grew quite a lot of tomatoes on stakes, but had not many perfect. In washing you take the bloom off the fruit.

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and that counts for a good deal. When you get the bloom off the quality deteriorates. In one acre and a half the plants were two feet apart, tied by a piece of wire. Stakes are of red oak, a quarter of an inch square, from centre to centre of the rows, squares of six feet. The plant ran from a single stem. John Clarke, near Brantford, has stakes running along the ground with a wire upon which he lays the plants about a foot from the ground. He claims that the fruit ripens earlier, and, if you figure out the loss from rot and cleaning, you are about 50 per cent. ahead on your profits. Rot is caused when dry weather is followed by wet. The inside cell walls during the dry weather harden, and lose the elastic quality. Then when the wet weather comes the plant sucks up all the moisture it can. The walls cannot stand the pressure and break, the bacteria gets in at the blossom end of the flower. I have lost nearly half a crop on clay soil.

A MEMBER: Black rot forms in a dry season. We have carried on experiments with staked tomatoes, and found they were worse affected in that way, even when the size of a marble.

F. W. G. PATTISON: On my soil we are not troubled with rot, but we have been with slugs, and we found staking a perfect preventive for them.

J. J. DAVIS: What advantage is there between staking and wires and strings. We use a string.

S. C. JOHNSTON: It is claimed that you can get more plants in a greenhouse in that way, and reap greater returns.

J. J. DAVIS: It is a question between the string and the stake.

S. C. JOHNSTON: I did not find many cases of the string being used. Some claim that they can put up more stakes in the same time than when they use string. They have a neater appearance, and the house can be gone through very quickly, straightening the vines up.

J. J. DAVIS: I thought it would be the other way about. We simply twist the string.

A MEMBER: The string would be cheaper than the stakes?

A. H. MACLENNAN: No.

A MEMBER: How far apart were the pipes placed in the soil in sterilizing?

S. C. JOHNSTON: Three feet.

A MEMBER: What do they prefer, steam or hot water heating?

S. C. JOHNSTON: That would depend on the size of the plant. Hot water in small, and steam in the larger plant. Some have installed the hot water system on the large plant, and it is giving satisfactory results. For one man who uses hot water ten prefer steam, saying that it is cheaper, and gives as good results.

MR. S. C. JOHNSTON also delivered an address on "Special Types of Greenhouses," giving a brief resume of information he had gathered on this subject on a visit to a number of the leading centres in Ontario and across the line. This information is being issued in bulletin form, and will be available to be forwarded upon request in the near future.

A MEMBER: Are there any iron frame houses in this Province?

S. C. JOHNSTON: There are two in Ontario that I know of at Hamilton, owned by Nairn Bros., one 45 by 125, and one 75 by 200 feet. I was out there and they told me nothing else would suit them.

J. J. DAVIS: I came to the conclusion that I would use a wood angle plate. I made a plate of three by five cypress, which made 2¾ by 4¼. Then I got galvanized iron from a tinsmith and put that like a kid glove to fit it, and made long enough on the inside so that it would turn up. I could not get the gutter made.

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I never saw one like it. I saw all kinds of wooden eaves not much better than I had, but this is a nice-looking one, with a gutter which carried all the water off on the outside. It is just a sheet of galvanized iron, which when soldered is absolutely waterproof.

THE PRESIDENT: I am sure we have got a lot of information from Mr. Johnston's address, and that is only one of the good things we get by being associated together.

GREENHOUSE CONSTRUCTION AND HEATING.

W. R. COBB, NEW YORK.

MR. W. R COBB, New York, gave a talk in the evening on "Greenhouse Construction and Heating," illustrated by a number of artistic and carefully prepared lantern slides. He said:

Most vegetable houses used by large growers up to within the past few years have been of the ridge and furrow type, some twenty feet wide and varying up to forty feet. Until recently, few have built houses wider than thirty feet, and the majority have not been over twenty feet.

There are numerous types of greenhouses used in different parts of this country and in the United States for the growing of vegetables. They run in size and shape from the small lean-to six feet wide, and the dug-out ten feet wide built with hotbed sash forming the roof, to the most recent production 72 feet wide and built with steel and iron frames.

In Massachusetts at Arlington where a number of vegetable growers are located, houses 50 feet wide and 200 feet to 300 feet long have been built. These houses are generally built with pipe posts for the sides, pipe columns and steel purlins. In fact, the construction approaches very nearly what is known amongst greenhouse builders as "Pipe Frame Greenhouse Construction."

There are three types or classes of construction, viz.: all wood, pipe frame, and all steel frame. In the first, wood is used throughout. In the second, a certain amount of iron and steel is introduced, and in the third all members which carry any weight, are constructed of steel or iron. The first is cheaper than the second, and the second is cheaper than the third. Type one deteriorates rapidly; type two is worth 50 per cent. more when you take into consideration the up-keep and lasting qualities; type three is the cheapest of all in the end.

With each of the above types, the cost of painting, glazing, benches and heating is the same; one only saves on the material, and this is almost offset by the increased cost of erecting.

The most successful vegetable growers, as well as the most successful cut flower and plant growers are building separated houses and increasing the width. Plants thrive better in wider houses; they cost less to heat, less to maintain and less to build. Let us take an example. Here we have a chart showing two ridge and furrow houses 21 feet wide each. The cost of the superstructure of these houses 100 feet long, of pipe frame construction, is approximately $2,300. The cost of the house 42 feet wide by 100 feet long, with the roof following the lines shown, extending above the ridge and furrow houses, $2,200. It costs about five per cent. less to heat the wide single house than it does the ridge and furrow house. It costs less to maintain. One man can take care of more square feet of benches

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with less trouble, to say nothing of securing better crops through having a larger volume of air, more light and a more even temperature.

Now take three ridge and furrow houses 21 feet wide by 100 feet long, of pipe frame construction. The superstructure of these houses costs, erected complete, $3,150. One house, 62 feet wide by 100 feet long, erected, steel frame, costs $2,907, and the same as to upkeep, etc., applies to this as in the first example. If the owner buys the material and erects same himself, he will no doubt save something, but it is a question if in the end he really does. If a careful cost of all labor that is performed by himself is kept, he will find that what little is saved is not worth the superior workmanship that is furnished by those firms who make a specialty of this work.

Interior of largest Pipe Frame Greenhouse in Canada.

The material for the two ridge and furrow houses, 21 feet by 100 feet, is worth $1,650; that for the 42 feet by 100 feet, iron frame house, $1,600; for the three ridge and furrow houses, 21 feet by 100 feet, $2,275; for the 62 feet by 100 feet, iron frame house, $2,116. These prices include glass, paint, stock and putty.

In regard to benches, most vegetable growers plant directly in the ground—some use raised plant beds. Where the vegetables are planted directly in the ground, a board about eight inches high separates the beds from the walks. I have seen some beds with a cement curb around each of the beds. This is neater and more permanent, but does not insure any better crops. Where raised benches are used and hemlock is cheap, a bed costing not over 10c. per square foot can be built. Beds built entirely of sound knotted cypress can be built for about 14c. per square

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foot. Concrete can be built for 15c. per square foot, but the cost of the forms is very expensive, and unless there is a large quantity it increases the cost to 25c.

In regard to the heating, a hot water gravity system for a small plant is considered the most satisfactory, using a two inch pipe placed on the sides and on the beds or columns. Such a system as this is economical up to a certain point, say up to a plant containing 30,000 square feet of glass.

After this, a steam system or hot water pumped around, should be installed. There are three systems of heating with steam. Gravity and vacuum systems, also a system which requires the condensed water to be returned by a pump, or trap. Where pumps or traps are used it requires power of some kind to operate same. As to which is the most economical to maintain, there is a wide divergence of opinion. In the States the vacuum steam has met with a great deal of favor, and from actual figures obtained, this appears to be first in economy. A circulating hot water system operated by pumps in several large places has proved very satisfactory, and the owners as they enlarge, cling to same. In one instance, I know where steam was abandoned and hot water substituted. The same pipes were used, but a power pump was installed.

HEATING: Take a house 40 feet by 100 feet with one gable. The cost of a hot water system with sufficient radiating surface to maintain a temperature of 45 degrees to 50 degrees with the thermometer at zero outside, erected complete with boiler power, would be approximately $845. The same heated with a gravity steam system, $551.

The cost of material only for the above—hot water, $700; for steam, $445.

The same house heated with hot water to a temperature of 65 degrees to 70 degrees at zero outside, would be $1,378 for installation complete: for material only, $1,137. For steam installed complete, $970; for material only, $686.

In all cases guaranteed wrought iron pipe has been figured. Merchants' or steel pipe would reduce the figures somewhat. It is a mistake to use anything but the best pipe, as the chemicals contained in the water attack steel pipe and if it is not kept well painted on the outside, the moisture in the greenhouse causes the pipes to deteriorate from the outside as well.

VENTILATION: It is best on all vegetable houses to have at least two lines of ventilating sash at the ridge, and one line on the side. If possible, have a line on each side.

It would seem in theory that a large house would require more ventilation than a small house. In practice it has been proved just the opposite. It is not necessary to increase the size of the ventilating sash in large houses over those used in smaller ones.

VEGETABLE GROWING EXPERIMENTS, DISEASES OF VEGETABLES, AND FIELD CROP COMPETITIONS.

A. H. MCLENNAN, B.S.A., GUELPH.

My subject for this evening is rather an extensive one, and for that reason I shall deal with only a few of the many important topics which might be taken up.

First of all, I would like to speak about two very important troubles of the market gardener, namely, celery blight and the maggots which attack onions, cabbage and radish.

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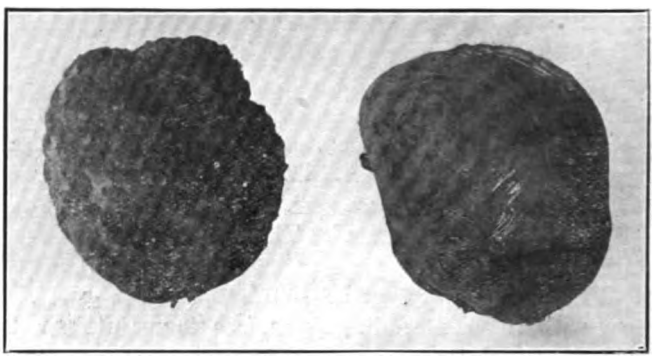
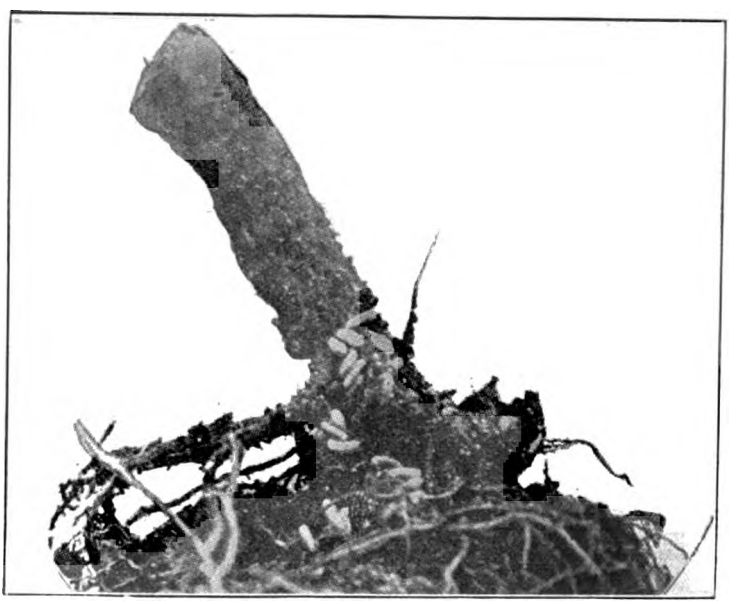
Late blight of celery (*Septoria Petroselim*), appears first as rusty brown spots on the outer leaves. These gradually spread under favorable conditions until the leaf dies. The spots will also be found on the stems. A season of warm, moist weather is most suitable for its spread, and it will also appear in the storage house. It can be prevented by the use of Bordeaux Mixture if applied at the right season. Our work here the past two years has shown that if we wish to grow celery at a profit, we must spray often and thoroughly.



Powdery Scab of Potato.

Cabbage, onion, and radish maggots are the larvæ stage of two winged flies almost identical in appearance. The adult appears generally about the 15th day of May till the 15th day of June. The eggs are laid close to the host plant and are hatched in three to ten days' time. The worm which hatches being without wings or legs, is helpless unless against its host plant. For the cabbage maggot, the tarred felt paper disc is a sure cure. For the onion and radish maggot no sure cure has been found. Carbolic acid wash and kerosene and sand have been



Cabbage Maggots on Stem of Young Cabbage Plant.

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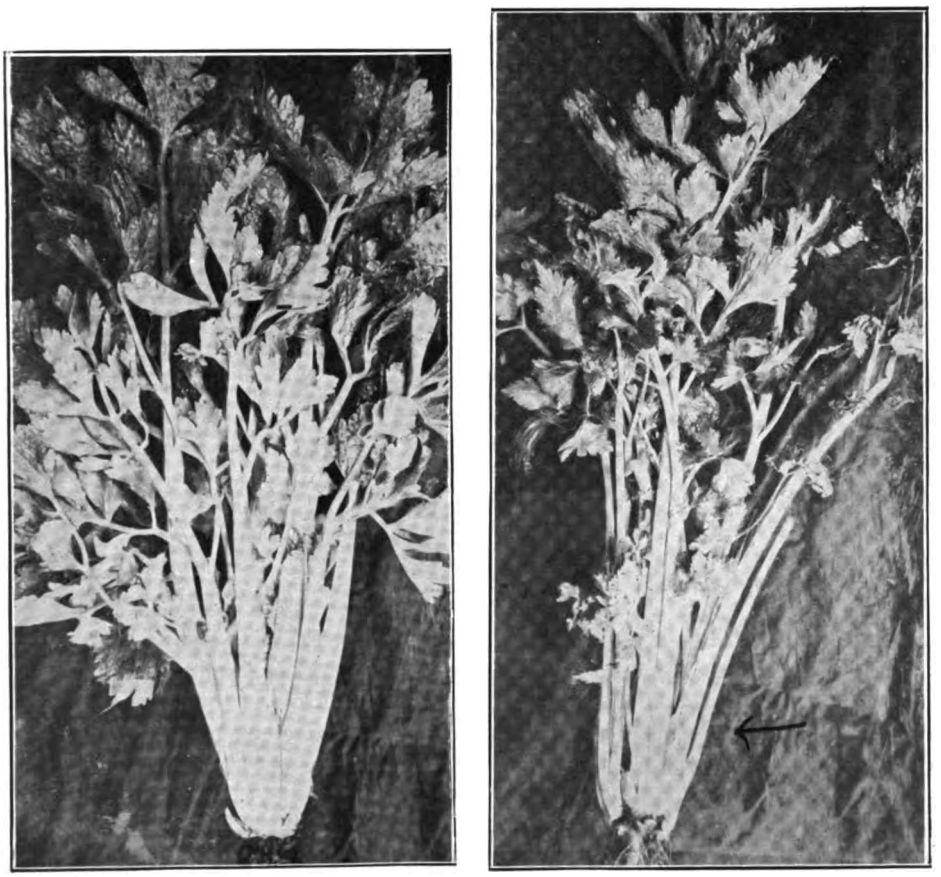
used. Now it would seem to me that we, as a Vegetable Growers' Association, should try to have these tried out commercially. In each branch where the crops are grown, a demonstration could be carried on to show the results obtained from such treatment.

In many sections of Ontario it is becoming quite a problem to obtain the necessary quantity of barnyard manure used in intensive gardening. As our industry grows this will become more acute, as it has in many parts of the United States. On this account it is necessary that we make use of commercial fertilizers.

For the past three years we have been carrying on tests with commercial fertilizers in different combinations in our College. While this work has been very



Celery Blight, showing plants affected.

successful, it brings one to the conclusion that if we are to obtain results that will be of value to our commercial growers, we must carry on tests in each district. These tests need not be elaborate, involving a great amount of labor and figures, but can be judged by comparison. They could be carried on under the general direction of Mr. Johnston or myself, and would give us a much more definite idea of how we must combine the different constituents to meet the needs of each particular section and crop.

In talking this fall with a couple of representatives of large commission houses in Ontario, they spoke of the increasing demand for head rather than leaf lettuce.

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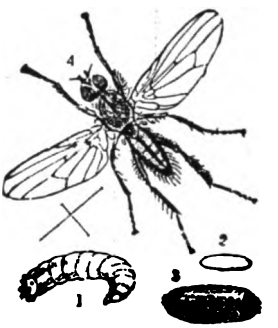
You will remember that this matter was brought up at your last meeting. I have been experimenting for two or three years to find out what conditions are necessary for its growth here in Ontario. We find that in our clay soil sub-irrigation is absolutely essential, but I should think that in the sandy soil that many of you have in your greenhouses, the method used in Boston of soaking the soil two or three days ahead of planting would answer the purpose. I find also that transplanting into two-inch pots before they are placed in the bed helps greatly to obtain a perfect stand.

I have also been growing cauliflower among my third or fourth crop of lettuce. I find good demand for it at a fair price. We start the seed in late November and carry the plants in 2½ inch or 3 inch pots until ready for the bed.

For some years I have been trying to breed a cucumber of the American type with the fruiting habits of the English varieties, which will set freely without being pollinated. You all know that in dull weather most of our American varieties refuse to set unless bees are kept in the house. I have several strains which appear of exceptional value and whose appearance has suited nearly every one who has seen them. These I hope in another year to be able to pass out to you for your trial.

I have also been working on tomatoes. For indoor work I have been trying to



Cabbage Maggot, puparium and fly—enlarged.

breed the good qualities of the Industry tomato—especially its disease resistance—on to the pink tomato which I obtained in Grand Rapids, Mich., four years ago, and which has exceptional thickness of flesh with thin skin but good carrying qualities. These I hope also before long to be able to give you to prove out in your hands. I may say here that I have made it a practice to send out seed of varieties which have proved of value under our conditions, to any who desired, hoping by this means to be able to give you something which will increase your returns.

We all know that, frequently, we obtain seed which is not what it is represented to be, and, probably, have tried to find some way to overcome this difficulty. For a number of years we have grown seed of various vegetables as radish, lettuce, beets, cabbage, tomatoes, onions, melons, etc., with excellent results. The Dominion Government last year made some provision for assisting in this work. Can we not help along by experimenting, under the care of your Association to find out where, commercially, we could grow seeds, in the province?

Would it be possible for you to add cabbage and cauliflower to the three crops already in the competition? They are very important crops in the province, and could be judged in the field in the fall, and then shown at the Horticultural Show in November. The interest in the competition before has been great, and the addition of these crops should tend to increase this interest.

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In closing I would again suggest that demonstrations be made in the various branches where the crops are grown, to show how the late celery blight and the maggots attacking onions, radish and cabbage can be controlled. You have among you Mr. Johnston, who can take charge of this work, and I am sure that you will find it money well spent.

In the field crop competitions held there has been much uncertainty as to varieties, and whether the crops were early or late season. In onions, none knew whether they were from seed sown directly in the field or were transplanted, also there was a difference of ideas regarding color. Near Ottawa, mostly all the onions are red; in Western Ontario, yellow. This is a matter which your executive can easily decide before the next competition.

There were, also, different ideas as to the rules of the competition of prize winners at Toronto. More especially was this seen with regard to celery. Many did not send sufficient quantity to fill the box specified. One very fine sample from London had been packed in a tight box, and when opened was heating. It should have been packed in an open crate. It would be better in a competition where the article is perishable, if each contestant would send a larger quantity than required, and then that it be repacked on arrival in Toronto, as the celery was this year.

Another point that I think should be looked into, is the arrangement of the various districts. While I think that under the circumstances your executive did the best they could, I would like to suggest that, if possible, each branch be made a separate district with the prize winners being brought to Toronto as this year. This would seem to me to be fairer to all concerned.

FORCING LEAF LETTUCE AND CUCUMBERS.

C. W. Waid, New Carlisle, Ohio.

The man who has had no experience with the growing of lettuce in the greenhouse should make up his mind before he undertakes to grow any that he will be obliged to give very careful attention to details if he expects to succeed. The growing of lettuce under glass is very different from growing it in the open. It is easier to get good results the first season or two than later when the soil begins to need special attention, and disease germs become more numerous than they are in the original soil. I do not wish to discourage anyone, however, but rather wish to cause the beginner to make up his mind that he will try his best to make a success, and if he does that and carries out his good intentions he will have no need to fear the consequences.

The Seed. The one leaf variety of lettuce which is grown to any extent in the Middle West is the Grand Rapids Forcing. There are several strains of this variety, almost as many in fact as there are seedsmen selling it. There is very little difference between many of these strains, but some of them are far from what might be called the ideal strain. One of the greatest defects in seed is to have a large number of the coarse dark green off-type plants develop from it. This defect is variable, not only with the seedsmen but with the season. A good plan, when time permits, is to get a sample of seed from several reliable firms and test each before making the final purchase. If there is not sufficient time for that plan to

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be followed, the next best thing is to write to several seedsmen and ask them whether they have tested their seed for that defect, and, if so, what percentage of off-type plants they found, and then select from the seedsman having the smallest per cent. of off-type seed, the variety of each seedsman being taken into account.

GROWING THE SEED. After good seed has been secured, the grower should see that he grows enough for his own use. It is not necessary to grow plants for seed each season, as the seed will be good for at least three or four years, if it is kept where it will not get damp. After it is two or more years old it may not germinate quite as well as when it is not so old, but, by sowing the seed a little more thickly this difference can readily be overcome.

To grow the seed the plants should be started in the greenhouse and transplanted to a good garden soil outside as early as the soil will work nicely. The plants should be set in rows far enough apart to be cultivated easily, the plants 12 to 15 inches apart in the rows. Thorough tillage should be given throughout the season. The plants should be trained to stakes or in some way supported to prevent their being blown down by heavy winds. After the seed has matured and before it has begun to fall, the stalks should be cut and hung in a dry building for a short time, after which the seed can be removed from the stalks by shaking and pounding. The chaff and seed can be separated fairly well by sifting and by "winding."

GROWING THE YOUNG PLANTS. One of the very important things to attend to before sowing the seed is to have good soil in which to grow the young plants. This may be muck, a sandy loam or a clay loam, but in any case it should be as free as possible from weed seeds and disease germs. Some growers sterilize the soil used for the seed beds by placing it in boxes through which perforated steam pipes are run, turning on the steam until the soil is literally cooked. This process kills all weed seeds and nearly, or quite, all disease germs. No soil should be used more than once for starting the seed in, especially when there is evidence of presence of disease germs, unless it has been sterilized in the meantime.

The time to grow the seed will depend somewhat on the location and on other things which govern the time it is desired to have the first lettuce ready to sell. In central Ohio we usually sow the first seed about August 1, and never later than August 15. At that time of the year it will take but one week for the plants to get large enough so that they will need to be pricked out. The plants should be large enough to set in the permanent beds in from four to five weeks after the seed is sown. In mid-winter, when the days are short and many of them cloudy, it will take fully twice as long to grow the plants as in the longer, brighter days of early fall and late spring.

One of the difficult things to do when growing lettuce in the greenhouse is to have the crops mature at the right time and to have the plants just the right size when the bed space is ready to be planted. If the area to be planted is small this problem is not so great, but when there is from one-fourth to an acre to plant, and the grower desires a succession to be able to supply his customers regularly and continually, he has more of a problem than the casual observer would imagine.

With about one-fourth acre of bench space it has been our plan to sow enough seed so that we would get at least 10,000 plants from each sowing, or enough to plant one-eighth of the space. By making these sowings every five to seven days, the entire area can be planted in from six to eight weeks. If the days were of the same length and an equal number bright every week it would not be hard to keep

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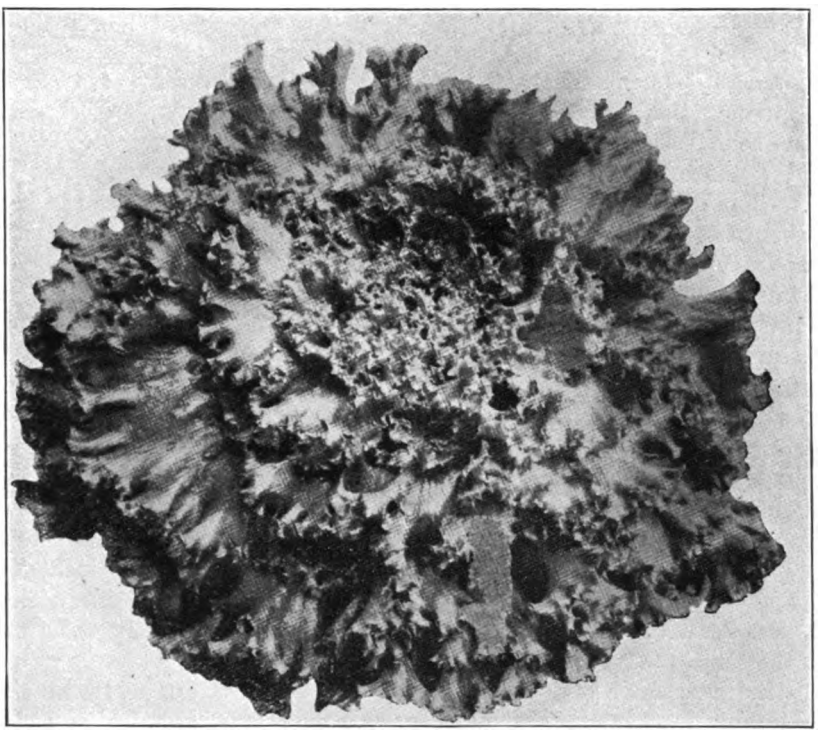
the supply of plants on hand as they are needed, but the great variation in this respect makes it a difficult problem. We have been able, however, to meet it by using pots.

The seed may be sown in flats or in the soil in the bench or bed. If sown in flat, it should be kept in the greenhouse, as it is easier to keep the plants from becoming infested with insects and also more convenient, as a rule, to water. The seed may be scattered broadcast or sown in rows, there being little difference in the results except that when sown in rows, the soil may be stirred, if necessary, and the plants are easier to take up and prick out. The seed should be sown very thickly, if space is any object. We made it a practice to sow thickly enough so



Lettuce.

that we could get at least 2,500 plants from a flat 16 by 24 inches in size. It is necessary to prick out plants promptly when they are ready, if they are as thick as that in the flats or beds, as a day or two too long will cause them to "spindle" if they are not handled. After plants once spindle they never fully recover and, as a rule, when they are badly drawn up they had better be thrown away and others used in place of them.

The seed should be covered very slightly, if at all, with sand or muck. It should not be covered deeper than the seed is thick. When the sun shines hot, as it does during August, the seed should be covered with heavy paper which has been saturated with water or with gunny sacking or similar material. The covering should be kept wet, and, if it is open like gunny sacking, the watering may be done through the covering. One of the advantages of the use of flats to start seeds in is that they may be watered by setting them in water that is not too deep. This will

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afford sufficient water to carry them through without further watering, and in no way interferes with the seeds. If the seeds must be watered with a sprinkling can the rose should be very fine and the water applied with as much care as possible, or the seeds will be washed around, more or less. The plants should be given sufficient heat day and night, and all of the ventilation they can be given in the summer and all they need in winter.

DISTANCES TO PLANT. While no doubt most individual growers have carried on one or more tests with the idea of determining the best distance to plant lettuce, the Ohio Experiment Station has done very thorough work along this line. The conclusion to which the station authorities came was that for a market demanding a medium sized head, three or four to a pound, seven and a half inches each way gives the best results. If larger heads are desired, eight by eight inches is a good distance. An occasional grower spaces lettuce wider one way than the other, seven by ten or eight by ten inches, in order to permit the running of a hand wheel hoe or cultivator through the lettuce in one direction. This can be done, of course, only for a short time after the lettuce is set.

Where leaf lettuce is sold by the dozen it is not necessary to grow as large heads as where it is sold by the pound. For that reason the lettuce can be placed closer when it is to be sold by the dozen. Some growers space it six by six inches and others five by five inches.

UTILIZING SPACE. One of the big problems with every grower is to have his plants just the proper size each time they are needed. If he is supplying a regular trade and wants a constant supply, the problem is still greater than it is when he sells nearly his entire crop at once and has no more to sell until another crop grows.

We have worked out a scheme which has been very satisfactory to us, and I am sure a good many other growers could make use of it profitably. It has been our custom to grow the plants in flats. We continue to do this for first crops. For all lettuce after the first crop we have found it a decided gain to pot the flat grown plants when they begin to touch in the flats. We use two inch pots, and they are plunged into the soil between the permanent lettuce plants. That is, a row is made between each two rows of permanent plants, setting twice as many pots as there are permanent plants. The pots are plunged as deeply as possible, but with the tops not below the surface of the soil. After the pots are in place there is nothing further needed than to care for the regular crop in the usual way.

Of course an abundant supply of water should always be present in the soil to keep the pots well moistened. The bed or bench should be well soaked just before it is desired to remove the potted plants. If the plants are kept clean and the precaution taken of watering them thoroughly just before taking the plants out, there will be little or no trouble about the plants sticking in the pots. Plants grown in this way require no extra room; after they are potted they require practically no extra labor, and they can be allowed to grow to a much larger size and be transplanted without checking better than in any other manner of growing with which the writer is familiar. If this plan is faithfully followed throughout the season it will mean the gain of one full crop a season.

VENTILATION AND WATERING. These two operations are very closely associated. As I have endeavored to show in former addresses there is greater need, in my opinion, of more attention being given to ventilation than is now given by most growers. A humid, moist atmosphere not only does not furnish the best conditions for growth, but does furnish the best environment for the development

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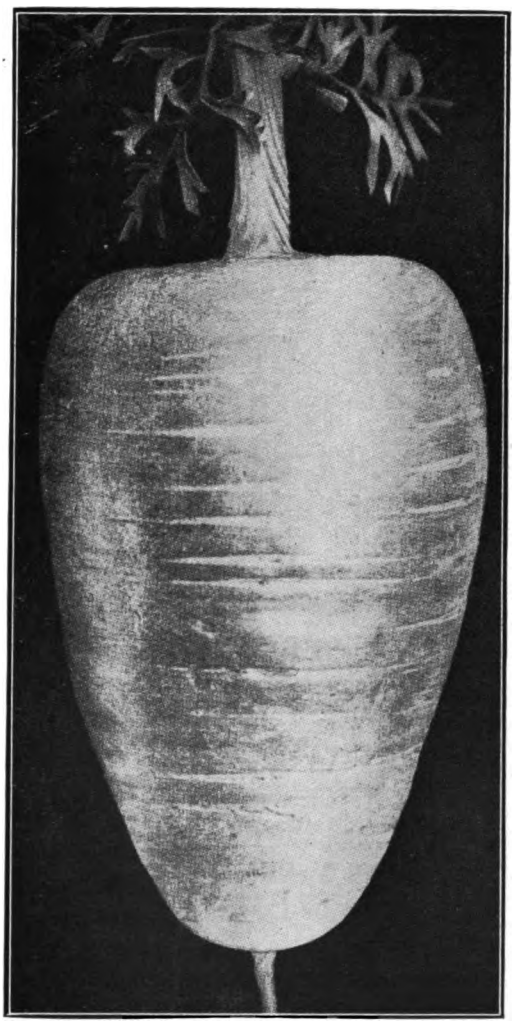
of certain diseases, especially lettuce rot in its various forms. It is the writer's opinion that with the vents open the larger part of every day, except stormy days and days with very low temperature, and a few inches on warm nights and with proper sanitary methods, little or no trouble from lettuce rot will occur. This statement is backed up by the writer's own experience and by somewhat extended observation.



Good type of Carrot.

If on top of poor ventilation injudicious watering is done, the harm may be great. When the water is applied on the surface of the soil and must necessarily wet the leaves, it should be done only on bright days and early enough in the day to permit the water to dry off the leaves.

If the lettuce is to be tender and crisp, it must grow rapidly from start to finish. If a bed or bench is allowed to become too dry the lettuce will check up in growth and the leaves become more or less tough. I have seen lettuce in several houses which appeared to be attacked with the disease known as rosette, but which

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on close examination proved to be suffering from lack of water. Too much water can be applied, but this is seldom done.

The ideal way to water lettuce is by sub-irrigation. This permits of a constant supply at the roots without wetting the leaves. I make this statement with full confidence of the correctness of it, as I have had the opportunity to observe the two systems side by side for ten or more years. The great objection to sub-irrigation is its first cost. Next to sub-irrigation I prefer the overhead or mist spray. In no case would I engage in lettuce forcing under glass unless in a very small way, if I were forced to use the old method of watering with a hose. In putting in pipes for the Skinner system we had them run the full length of the houses, or two hundred feet. We found later that if we had run them each way from the centre of the houses it would have been more convenient, as we often had mature lettuce on one half which did not need water and small lettuce on the other half which did.

One of the things which is very important is to thoroughly soak a bed set to lettuce as soon as the plants are in place. The roots occupy a very small area at that time, and the water must be abundant in the soil or the plants will not get sufficient moisture to start them off properly. We also aim to give a very heavy watering two or three weeks before the lettuce was to mature, and none later if it could be avoided.

CUCUMBER FORCING. Owing to the fact that cucumbers grow very rapidly under favorable conditions, most growers do not attempt to grow any crop like lettuce between the cucumber hills when the plants are small. Plants in flats or pots can occupy the vacant spaces to good advantage for a few weeks after the cucumbers are set.

Cucumbers, like melons, will not do as well after they have been checked in growth, as they will when kept "on the jump" all of the time from "seed time to harvest." If the leaves are of normal size and dark green and the growth is rapid, the plants should do well. If the leaves are yellowish or stunted and slow to grow, the addition of nitrate of soda in small doses will help to get them on the right road again. Plants should not be allowed to get too large before being set in the permanent beds or benches. The last transfer should be made before there has been much growth of vine.

WATERING. As soon as the plants are set, the soil should be given a liberal supply of water. The root system of the plants is confined to a very small area for a few days after the plants are set and it is necessary that water be available where the roots can get it. Unless the setting is carefully done, there is danger of air space being left around the ball of earth which contains the roots. These air spaces will prevent the proper movement of the water in the soil unless it is present in quantity and well distributed The soil should never be allowed to dry out when the plants are first set as they are very susceptible to injury at that time. After they have had time to form a considerable root system, there is not so much danger of injury by lack of water in the soil, but cucumbers will make use of large quantities of water during the fruiting period and will suffer from lack of sufficient water at any time.

Cucumber foliage seems to thrive best when it is given at least an occasional shower bath. It is best to make such applications early in the day and on bright days so that the foliage will go into night dry.

If the red spiders make their appearance, water thrown with force against

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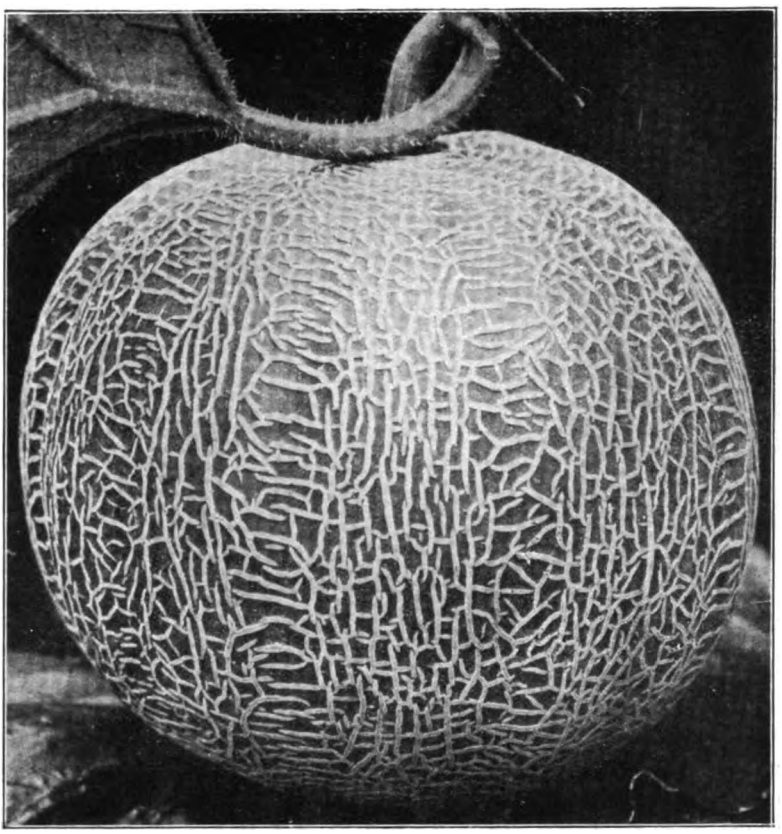
the under sides of the leaves will usually vanquish the intruders, especially if taken in time and persisted in.

VARIETIES. The White Spine is the type of cucumbers most commonly grown. Some growers prefer the short, stubby type and others the long green. One of the most important characteristics is that the plants should be productive. Another important quality is that the seeds should be developed as little as possible at the time of gathering. Fancy trade demands a cucumber uniform in diameter and, as a rule, of good length. This demand has led to the crossing of



Melon.

the White Spine and English Forcing types to increase the length of the fruits. It is not an easy matter to secure an ideal cucumber, either by crossing or by selection. There is usually some undesirable character, such as crooked or pointed ends, developed.

SPACING AND TRAINING. There is more difference in the spacing of cucumbers in the greenhouses than with any other crop. Growers who train on an "A" trellis, space the rows 8 or 10 feet apart, and the plants a foot to 18 inches apart in the rows. Those who train the plants upright set the rows from 2 to 3 feet apart and the plants about 2 feet in the rows. Personally I have always favored the 2 x 3 feet spacing or 2 x 2 feet, as it gives a more uniform distribution of the foliage and roots than when the plants are set much farther apart one way and

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closer the other. In houses that are built low on the sides, upright training cannot be done. Thus the "A" trellis will of necessity be used in such houses. Cucumbers, unlike tomatoes, will cling to strings or sticks if the vines are twined about them.

Some growers prune much more severely than others. It has been our practice to clip off each lateral just beyond the first female bloom. This gives a fair amount of foliage and not too much, and I believe produces all the crop the vines should be allowed to bear.

Cucumbers are, in my judgment, harder to grow than tomatoes. The requirements of the crop are more exacting. The plants should be kept "on the jump" so to speak. The temperature of the house in which they are grown should not be allowed to fall below 65 at night and may run much higher on bright days if the vents are open. Cold draughts should be avoided as far as possible.

POLLINATING AND PRUNING. Cucumber blossoms can be pollinated very satisfactorily by placing a hive of bees in the house. Some growers prune much more severely than others. Our plan has been to cut off all lateral branches just beyond the first female bloom. The pruning should be done frequently in order that energy of the plant may be directed mostly toward the formation of that part of the vine which will produce the fruit.

Cucumbers should be picked at least three times a week. Some growers make a practice of picking every other day.

GRADING. It has been our practice to make two grades of cucumbers, the first grade consisting of all long regular shaped, well-colored specimens, and the second grade differing from the first mainly in the matter of length. All "nubbins" are discarded. There is a demand, however, among a certain class of people in large cities for the "nubbins," providing they are sold cheap. It never pays to ship them.

The kind of package used for cucumbers varies as much as for tomatoes. Baskets holding 2 to 2½ dozen are popular with some growers. Others use larger baskets. Some use boxes of various sizes and a few use barrels. We have used 24-quart berry crates for short shipments but do not recommend them. The kind and size of packages are not nearly so important as the grading and packing. Each grade should be plainly marked so that there will be no chance of anyone getting a second grade for firsts.

In packing them they should always be laid in so that the least possible space will be lost. Like tomatoes, if they are to be shipped any distance, a solid cover should be placed over the package.

Some growers have a fancy picture pasted on the package in such a way that when the package is opened the picture will be destroyed. Pictures may not have great value, but some mark which will enable a buyer to recognize the brand at a glance is invaluable.

When a person has once established a reputation for growing good produce and grading it honestly and packing it neatly, he will find that his brand is always in demand. It will not do, however, for him to get careless and "let down the bars" so to speak, or he will lose in the short space of time, all he may have gained by honest effort. Some may say that the Golden Rule cannot be used in practice, but none who will search for the truth will say that "Honesty is not the best policy" in practice as well as in theory.

DISEASES AND INSECTS. Cucumbers are more subject to disease than tomatoes, and, for that reason, not so certain as to returns. A good cucumber crop with

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good prices is profitable, but a poor crop with low prices is the reverse. One of the diseases which cucumber growers must try to avoid is downy mildew. This is a disease induced by high temperature accompanied by excessive moisture. Draughts and sudden changes of temperature should also be avoided.

Another very destructive disease is nematodes. This trouble can be detected by examining the roots, and, if knotty growths are found, the nematodes are at work. A very sickly weak growth of the vines which cannot be accounted for in any other way usually indicates root trouble and nematodes is the most common as well as most destructive of all root diseases. Sterilizing the soil with steam is the only sure method for this trouble.

The striped cucumber beetle and stink bug are two very serious enemies of cucumbers under glass. A strenuous effort should be made to keep these insects from gaining a foothold on the cucumbers. In small houses it is not impossible to keep the stink bug under control by hand picking. In large houses, screening the vents is the surest method of combating them. Hydrocyanic acid gas may be used but it is dangerous to plant and animal life and should be used only by those who are experienced in handling it. No crops on which the bettles work, such as melons, squashes or cucumbers, should be grown out of doors close to the greenhouse, as the insects will breed on these crops and go from them to crops in the greenhouses unless kept out of the houses by screens.

Feeding. Cucumbers are rank feeders and on that account must be well supplied with available plant food. Most greenhouse men keep the soil in their houses well filled with plant food, but, as a rule, the application of manure to the surface of the soil, after the cucumbers are planted, in the form of a mulch, will help the growth of the plants very materially. This is especially true when the watering is done with a hose, as it is quite sure to be done somewhat irregularly, and if no mulch is used the soil will dry out much more quickly and completely than when it is mulched. Care must be taken not to use horse manure which is heating, as it will burn the cucumber foliage. With an abundance of plant food and water in the soil, the watering done properly and the ventilators used judiciously, little trouble should result from cucumber diseases.

Grading Tomatoes. While on the subject of grading, growers of fruits and vegetables have as a rule learned to grow good products, but very few of them have learned to grade well or to pack neatly.

One of the crops which will well pay for pains and trouble in grading and packing is greenhouse tomatoes.

It would not, in my opinion, be wise for a greenhouse man to copy the southern grower in the matter of packing, for the buyer will be slow to learn that greenhouse grown tomatoes are superior to southern-grown, as we get them on the markets of the north. In fact, if greenhouse tomatoes are put up in the same kind of a package as the southern-grown tomatoes they will all be classed as southern-grown.

There is a decided lack of uniformity among greenhouse men as to the kind and size of package used for tomatoes. I have seen greenhouse tomatoes sold in pint strawberry boxes and in bushel baskets. When the tomatoes are to be sold without shipping, a small basket holding not over 20 pounds and without solid cover is quite satisfactory, when the sales are made to retailers. If shipping is necessary, the baskets should have a solid cover and the tomatoes should be packed so that they will not shake in the basket. If the shipment is to be made for a long distance it is best to wrap the individual fruits in paper.

In grading the fruits some fancy trade will pay a premium for tomatoes of

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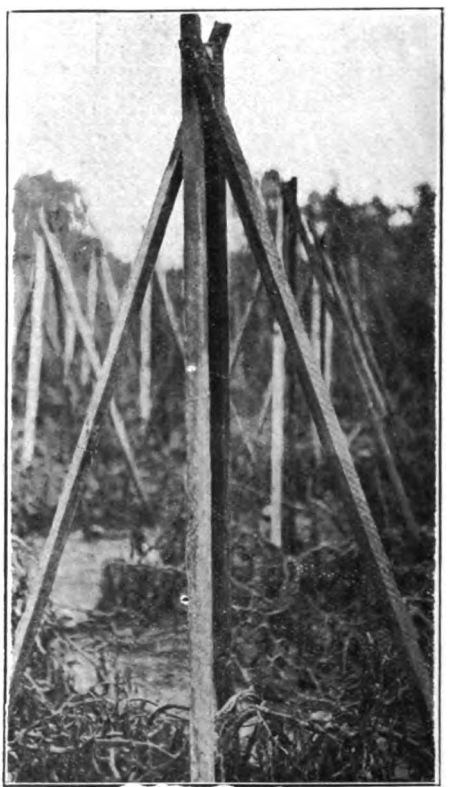
a uniform size. The average grocery trade, however, is not so particular as to size, provided they are not too large nor too small.

It has been our custom to make but one grade as to size until toward the close of the season when some fruits are too small to go as firsts. We have always been careful, however, never to put a single rough, irregular or defective fruit of any sort in the first grade tomatoes. When we have enough second grade to make it worth while to sell them they are packed separately and marked seconds. I am sure it would pay us better to destrop the second grade tomatoes rather than to try to work them off among the first grade.



Staking Tomatoes.

A grower who has never had any experience buying produce does not know how much value the buyer places on a "brand" of any kind of stuff he can depend on all of the time. When a dealer once learns that Mr. A's tomatoes are always graded according to a fixed standard he will pay a very good premium for them over B's package, upon which he can place little or no dependence.

It seems hard for a good many people to learn that it never pays to put the largest and best on top. There is no dishonesty and should be no objection to turning the stems of tomatoes or strawberries down, but when the best are put on top and the poorest in the bottom, deception has been practised and the penalty will be loss of reputation and customers. I would not be surprised that, in time, the man who is found guilty of "fixing the top" will be charged with getting money under false pretences. It is a short-sighted policy, to say the least, and should never be encouraged or practised by honest men.

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CONTROLLING CLUB ROOT OF CABBAGE.

By practising proper sanitary measures, club root, one of the most serious cabbage diseases, may be prevented from getting a foothold in the soil devoted to this crop. It must be remembered that this disease also attacks other members of the cabbage family, such as cauliflower, turnips, radishes, and weeds of the mustard family such as white mustard, charlock, shepherd's purse, black mustard and hedge mustard.

Growers are familiar with the yellowish, withered appearances of cabbages affected with this disease, and know how rarely such plants produce marketable heads. The roots of the diseased plants are greatly enlarged, are malformed, and fail to perform their function properly.

A parasitic organism called a slime mold is responsible for the diseased condition of the plant. This microscopic parasite gains entrance to the plant through roots hairs or through injured parts of the root. It feeds on the cell content, and the irritation that it provokes causes the cells to increase greatly in number and size. The parasite later transforms to a mass of spores, which are released into the soil on the decay of the affected root. The organism is reported as being able to live in the soil for a period of at least seven years and to attack susceptible plants at any time during that period.

In order to control this disease the department of plant pathology of the New York State College of Agriculture recommends that the land be heavily limed in advance of planting. Land to be used for cabbages next year should be limed in the Fall with one and one-half to two tons of quick-lime per acre. The best results are obtained when the liming is done eighteen months in advance of planting. Ground limestone or air-slaked lime may then be used.

It is especially necessary to keep the seed bed free from the parasite. Plants from infested soil should never be set. In keeping the farm free from this parasite the following suggestions should be observed:

Destroy affected roots as far as possible.
Boil affected roots before feeding them to stock.
Avoid applications of manure in the fall preceding a crop of cabbages.
Avoid transferring infested soil to other places.
Drain the land thoroughly.
Cultivate clean, destroying all cruciferous weeds.
Rotate crops.
Set healthy plants.
Apply lime to soil as indicated above.

REPORT OF THE MANAGER AND SALESMAN OF THE SARNIA BRANCH OF THE ONTARIO VEGETABLE GROWERS' ASSOCIATION, 1913.

By Henry Broughton.

As we meet together once more in our annual meeting at the close of another successful year, it is with the knowledge that Providence has been good to us in giving us a bountiful harvest in garden, orchard and field, for which I trust we are all thankful.

As an Association we commenced the season with bright prospects and have not been disappointed, as you will notice by this report, which shows a large increase in business over previous years.

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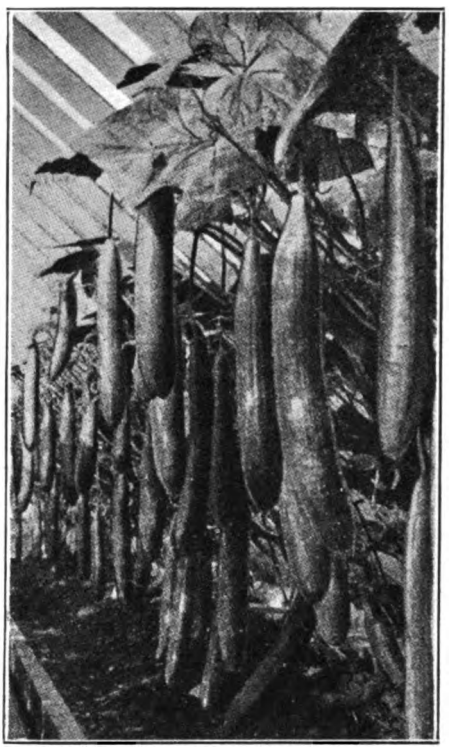
The efforts of our Association to instil a better knowledge among our growers of soil and crop requirements has not been in vain. We have found that by a judicious use of stable manure, supplemented with chemical fertilizers, consisting of potash and phosphates, we can produce heavier crops of better quality than by the old methods of manure alone and by so doing are able to increase our production over a much larger acreage than heretofore.

With a generous rainfall during the growing season which Lambton enjoyed, garden and truck crops have responded to generous treatment as perhaps never before, and some large yields are the result, which are sure to stimulate growers to higher ideals and greater success.

Prices have been satisfactory in all lines of produce and compare very favor-



Growing Cucumbers for Seed.

ably with wholesale prices in Toronto and American markets, and, being a large producer myself, I have endeavored to maintain prices with competitive points in the markets to which we ship.

We have not been able to do business with the Soo this season for the want of transportation facilities, as the N. N. Co. refused to carry freight to this city on account of losing a boat by fire at the beginning of navigation this year at Montreal. This boat, I was informed, was intended for the Soo traffic, but unfortunately was lost.

The N. N. Co. have given us good service this season with three boats weekly to the twin cities of Lake Superior and the management has, at all times, endeavored to meet our requirements and to allow us all possible time to deliver shipment to boats, and I am sure we all appreciate this.

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As we have a number of new members with us to-day I will give you the tonnage which the Independent Growers have shipped yearly for the past six years, as it was at this time we commenced shipping and working co-operatively with other growers, although I have been shipping my own produce since 1901.

Shipped during season of				1908	488 tons.
"	"	"	"	1909	481 tons.
"	"	"	"	1910	320 tons.
"	"	"	"	1911	540 tons.
"	"	"	"	1912	900 tons.
"	"	"	"	1913	1,122 tons.

You will notice a falling-off in our shipments during the season of 1910. This was the year one of Sarnia's commission men started in opposition to us and who has been trying to corner the business (or the selling end of it) ever since, and it remains with the growers of this district to say whether they want this or not.

The success which has attended the efforts of our Association to market our produce co-operatively should meet with the approval and support of every grower. The large increase of our business during the past two seasons should be proof of our ability to furnish the goods of the right sort and quality that the consumer desires. Our motto should be "From the Garden to the Consumer with the least possible cost and delay." This will surely bring the success that is worth while.

If our growers are alive to the opportunities that present themselves and will take time and care to ship *only first-class goods, honestly packed* there is a bright future before them. I can assure you we have the soil and we have the knowledge to produce vegetables and fruit of first class quality and second to none in this great country of ours.

From my observation and experience of the past twelve years in the shipping line I would strongly urge the growers to hold on to the selling end of their business, as therein lies the success or failure of a profitable business.

If your association has not access to all books and communications of your salesman, and are not in constant touch with outside markets you may be entirely in the dark and know little, or nothing, of the market value of your goods. Take the sugar beet business as an example. You grow the roots, but you know nothing about the profits or the price the sugar factories could pay the growers.

I may not be your salesman but there are others who could and would be should I drop out. I shall always give my knowledge and help to assist the producer to market his goods profitably.

If our growers had grown produce enough this season to supply all the enquiries sent us for produce I should not have had any trouble to increase the value of our total shipments for the season $5,000.00 above what it is.

Our shipments for 1913:

Cherries	938 boxes	Beets	816 dozen
Strawberries	2,237 "	Carrots	815 "
Rhubarb	906 dozen	Turnips	88 "
Radish	102 "	Corn	5,884 "
Onions	246 "	Celery	748 "

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Peppers	503	baskets	Green tomatoes	668	bushels
Cucumbers	3,642	"	Parsnips	600	bags
Beans	714	"	Turnips	1,010	"
Pickling cucumbers	535	"	Onions	1,123	"
Early apples	3,342	"	Beets	913	"
Plums	1,474	"	Carrots	1,472	"
Pears	3,817	baskets	Potatoes	10,018	"
Grapes	457	"	Cabbage	2,935	crates
Peaches	1,022	"	Apples	100	boxes
Tomatoes	19,660	"	Apples	578	barrels
Green tomatoes	997	"	Pears, winter	65	"

Melons, Crabs, Pickling Onions, Citrons, Squash, Pumpkins are not classified.

Total tonnage of season's shipments	1,122 tons
Number of cars of 25,000 lbs. minimum	93½ cars
Value of largest day's shipment	$2,081.00
Total value of this season's shipments	32,743.48
Increase in sales over last year	10,380.00

Containers used in shipping and value:

643 barrels	$302.21
3,175 berry boxes	7.94
15,136 bags	756.80
36,163 baskets	1,500.00
3,000 crates	750.00
Car fertilizers	716.00
Seed potatoes	338.50
Cost of Supplies	$4,171.45
Total weight of our shipments up lakes	1,002¾ tons

Thanking you for your co-operation and wishing you every success as an Association.

The Convention then adjourned.

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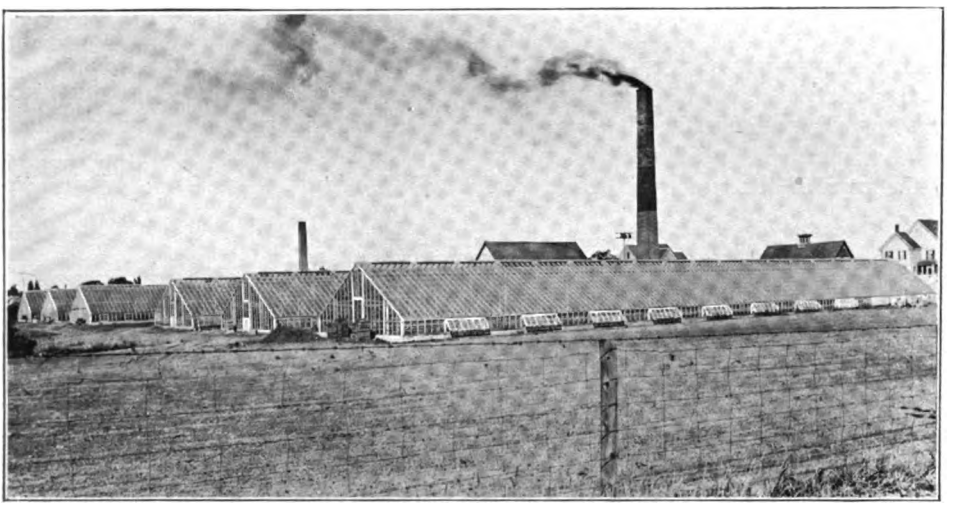
THE GREENHOUSE FOR THE MARKET GARDENER.

PROF. RALPH L. WATTS.

Many vegetable growers live remote from market or operate on too small a scale to justify the erection and maintenance of a greenhouse. On the other hand, a large number of gardeners are making shift with manure-heated hot-beds when they should have greenhouses to start their crops. It is poor economy to use hot-beds when greenhouses would serve the purpose so much better.

All of the arguments are in favor of the greenhouse when a large amount of glass is required. It is more economical to operate, both in fuel and labor required. It is much more pleasant as well as convenient to work in a greenhouse than to stoop over frames, especially if the weather is disagreeable. The greenhouse gives the grower more perfect control of the soil and atmospheric conditions. He is



Six Separate Houses.

inside the structure, where his eye notices very quickly whether the soil is too dry or too wet. The plants are not endangered by probable drops in temperature, because the boiler may be fired more heavily to furnish the proper heat. Cold air is admitted at will without cold draughts striking the plants, as is likely to occur when hot-bed sashes are raised for ventilation and watering. The air in hot-beds is likely to become too close and steamy, causing damping off, and weak, spindly plants; while these troubles seldom occur in greenhouses, although less attention is given to ventilation.

The greenhouses may also be used in forcing lettuce or other vegetables before the space is needed to start early vegetable plants. This gives employment to the farm hands during stormy weather, and, if the houses are properly handled, they become a source of revenue when there is no income from crops grown in the open. A greenhouse makes summer the year round on one spot on the farm, and this argument, although it relates to sentiment, is well worth considering.

It is not necessary to build very large houses unless the forcing of vegetables or flowers is contemplated. A house 30 by 75 feet will serve the purpose for twenty-five or fifty acres of vegetables. If the grower is skilled and can combine

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vegetable forcing with open ground work, he might be able to use to advantage an acre or more of glass, provided market conditions are favorable. The size of the greenhouse must also be determined by the number of available sash for cold frames. If the plants are merely held in the beds until the first transplanting, the house need not be large. At least eight hundred seedlings should be started on every square foot of bed or bench space if they are to be transplanted in about four weeks.

The prospective builder should study well built houses to become familiar with details which enter into the construction, but a few suggestions may be helpful to inexperienced builders.

The location is important. The house should be protected if possible from hard northern or western winds. It should be comparatively near the dwelling and convenient to the cold frames. The water supply should be considered in locating the greenhouse.

There are various forms of greenhouses: the lean-to, hillside, three-quarter span and even span. Of these types, the even span is the most popular. Definite experiments show that none of these types has an superiority over the others. It is largely a matter of preference, although the three-quarter span houses are better adapted to hillsides unless the ground is first graded. Houses which run northeast and southwest are satisfactory, although the position of the house with reference to the rays of the sun at different periods of the day is a matter of little consequence.

It always pays to use the best materials and buy from reliable builders. The wood parts should be well-dried cedar or cypress. A number of well-known firms make a specialty of sash bars and all other wood parts which are cut, when possible, in the proper lengths at the factory, thus making the carpenter work a simple matter. Full iron frame construction is on the increase, but the cost of building is so much greater than semi-iron construction that the latter plan is preferred by most growers. All wood parts should be given two coats of paint before glazing and a third after the glass is laid. It is economy to build houses that are not more than thirty feet wide. The roof should not be too flat or too steep. Most houses are built with a pitch of thirty to thirty-five degrees. The posts or walls should be durable. Formerly wooden posts were used exclusively. They are seldom used now, for iron posts and concrete walls have been substituted. Pipe purlins and interior posts and braces are also in common use.

It is desirable to use double strength "A" glass. Cheaper grades break more frequently by freezing of water under the laps, and the loss caused by large hailstones would be much greater. The freedom from blemishes is also an advantage. Sixteen by twenty-four glass is used most extensively, although larger sizes are frequently used. Some houses are built with the sash bars twenty-four inches apart, while the majority of builders object to more than twenty inches between sash bars. At this distance glass either twenty by twenty-four or twenty by thirty may be used. To secure the best glazing, the glass should be laid in putty with the convex side up, and care should be exercised in grading glass so that the laps, which should not be more than one-fourth inch, fit tightly.

Raised benches are rapidly passing out of use. Their cost of construction and maintenance is in itself a serious objection. The main reason for their abandonment, however, is that in the forcing of all classes of vegetables better results are obtained in solid beds. Cement sides, about three inches thick and a foot high, are often used to the solid beds, but even these are not considered an

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advantage in most successful commercial establishments. It means, then, that the entire area of the greenhouse is one plat to be farmed in a most intensive manner without the interference of benches, pipes, concrete sides of beds or concrete walks. Large doors are often provided at the ends of the houses so that teams and waggons may pass in and out with manure and soil. Plows and harrows may be used almost as freely as in the open. Alleys and walks are provided as may be necessary. All heating pipes are along the sides or overhead. It is by far the most economical arrangement, and experience teaches that it is entirely satisfactory. Raised benches are convenient for certain lines of work, but from a business point of view they receive the support of a very small per cent. of vegetable growers.

Both steam and hot water are extensively used in greenhouse heating. Each system has its staunch friends. It costs more money to instal a hot water system, but it is more economical to operate, and the pipes, when kept filled with water, are more permanent. With hot water the boiler may be left for a longer period at night without attention, because the pipes when filled with circulating warm water retain heat much longer than steam. Hot water, therefore, is much more desirable for small houses than steam, because the gardener can get along without a night fireman. Whatever the system, it is important that the boiler and radiating surface of pipes be adequate to maintain the proper temperatures in the coldest weather. With a first-class hot-water system it is possible to leave the boilers for seven or eight hours, even with zero temperature outside.

No greenhouse plant is complete without a good potting or transplanting room. It is often convenient to have this room over the boiler-room or adjacent to it. See that it is properly heated, ventilated, lighted and well provided with good work tables or benches. This room should be made pleasant and comfortable to secure the best service of the workmen.

POISONED BRAN MASH FOR CUTWORMS.

Onions are subject to serious attacks by certain cutworms. These appear sometimes in great numbers in spring and early summer, and frequently do severe injury before their ravages are noticed. Their method of attack is to cut off young plants at about the surface of the ground, and, as cutworms are voracious feeders, they may destroy many plants in a single night, frequently more than they can devour. They destroy hundreds of thousands of dollars' worth of crops every year.

The usual method of control is by the use of poisoned baits. To a bushel of bran one pound of arsenic, or paris green, is added and mixed thoroughly into a mash with eight gallons of water, in which has been stirred half a gallon of sorghum or other cheap molasses. After the mash has stood for several hours it should be scattered in lumps of about the size of a marble over the fields where injury is beginning to appear and about the bases of the plants set out. It should be applied late in the day, so as to place the poison about the plants over night, which is the time when the cutworms are active. The application should be repeated if necessary.

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GETTING CLOSER TO THE CONSUMER.

The Growers' and Shippers' Exchange of Rochester, N.Y., prefers to make sales f.o.b. loading station. However, salaried representatives are located in many consuming markets, and much business is transacted through regular middlemen. All sales are made after harvest.

An effort has been made, through advertising and personal solicitation, to sell direct to the consumer, but this has been found more expensive than working through large department stores or companies owning a number of grocery stores.

The Exchange had sale days for boxed apples in several cities, at which time it offered to deliver at any home in these cities at the flat rate of $2.25 per box. It cost the Exchange a fraction over 36 cents a box to make deliveries, thus leaving $1.89.

Better prices resulted from an arrangement made with some department stores, which paid the Exchange $2.00 per box, and sold on certain days to consumers at $2.25 per box, the retail price advertised by the Exchange. The Exchange received 11 cents more per box in selling to large dealers than in selling direct to the consumer. The efforts of this organization to set retail prices on small packages of farm products have been successful, particularly when special arrangements have been made with large retail dealers.

The public station for sorting, grading and packing farm products into small, registered trade mark packages is necessary for the producer to succeed in fixing the retail price at which his products are to be sold.

It does not seem advisable for a co-operative farmers' exchange to undertake packing and sorting their products except through a public, co-operative sorting and packing station, where a uniform grade and package can be maintained.

The best information obtainable shows that producers of farm products do not get an average to exceed 35 per cent. of the consumer's dollar when the products are shipped to market in bulk without any particular identity or in packages too large to reach the consumer. When shipments are made in small packages, labelled so that their origin is plainly shown, the producer often gets from 70 per cent. to 85 per cent. of the consumer's dollar.

This organization has found it possible to standardize the retail price on farm products by using a package small enough in size to pass through the dealer's hands without losing its identity by being divided into smaller packages before reaching the consumer.

Apples are thus marketed in pasteboard cartons holding one peck each, eight of which are in a crate; potatoes are shipped in 15-pound burlap or paper sacks, and grapes in 4-pound baskets. Each package bears the label of the Exchange.

The business of this Exchange has averaged 229 cars of fruit and produce a month, about 14 per cent. of which is put in small trade mark packages.

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SIXTH ANNUAL REPORT

OF THE

ONTARIO

Corn Growers' Association

1913

(PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE, TORONTO)

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1915

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To His Honour SIR JOHN MORISON GIBSON, Knight Commander of the Most Distinguished Order of St. Michael and St. George, a Colonel in the Militia of Canada, etc., etc., etc.,

Lieutenant-Governor of the Province of Ontario.

MAY IT PLEASE YOUR HONOUR:

I have the pleasure to present herewith for the consideration of your Honour the Report of the Corn Growers' Association for 1913.

Respectfully submitted,

JAMES S. DUFF,
Minister of Agriculture.

TORONTO, 1915.

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FINANCIAL STATEMENT.

RECEIPTS.		EXPENDITURES.	
Balance on hand from last year	$192 40	Cash paid out for prizes	$1,134 25
Legislative grant	500 00	Directors' expenses	355 50
Kent County grant	250 00	Judges' and speakers'	232 90
Essex County grant	250 00	Printing	438 27
Township grants	470 00	Advertising	69 18
City of Chatham grant	200 00	Bell Telephone Co.	10 00
Membership fees	465 00	Grants to School Fairs	15 00
Donations	258 75	Postage	75 50
Space in Exhibition Building sold	190 80	Auditing	8 00
Advertising in Prize List ...	277 15	Photographer	12 40
Building for Exhibition, shelving, fuel, light, etc., furnished by Chatham	300 00	Building for Exhibition, shelving, fuel, light, etc., furnished by Chatham	300 00
Corn sold	8 00	Membership buttons	35 98
Interest	6 87	Labour	21 00
Incidentals	2 00	Engraving cups, trophies etc.	26 40
		Express	78 43
		Secretary	150 00
		Treasurer	50 00
		Janitor	20 00
		Exchange	88
		Sundries	84 71
		Balance	302 62
Total receipts	$3,370 97	Total expenditure	$3,370 97

B. A. SMITH,
P. C. FOX, } *Auditors.*

J. H. COATSWORTH,
Treasurer.

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Ontario Corn Growers' Association.

ANNUAL CONVENTION.

The Sixth Annual Exhibition and Convention of the Ontario Corn Growers' Association was held in the Armouries, Chatham, on February 3-6, 1914.

The number of the entries and the attendance showed a small increase over the previous year, but a great source of encouragement was the improvement of the quality of the exhibits. Six hundred and seventy exhibited corn in the different classes, while the attendance was estimated at sixteen thousand.

ADDRESS OF WELCOME.

JOHN MCCORVIE, MAYOR OF CHATHAM.

It affords me much pleasure to welcome to Chatham the Ontario Corn Growers' Association and the friends of the organization who have come to attend this the sixth annual meeting.

It is hardly necessary for me to emphasize the importance of such a meeting as this not only to the City of Chatham but to the whole Western Peninsula.

South-western Ontario is essentially a corn raising district, and it seems especially fitting that such an organization as the Ontario Corn Growers' Association should be holding meetings of this kind annually to stimulate interest and spread information which will induce the raising of more and better corn. True, there are other sections of the country where corn can be raised to advantage. The counties to the north and east of us are going extensively into the corn raising industry, and are meeting with a large measure of success.

Kent and Essex have one decided advantage over other sections of the country in that the soil of the two western counties seems to be particularly adapted for raising corn. The climatic conditions are ideal, and I believe that these two counties have a future before them in the raising of seed corn for other and less favored districts.

We hear a great deal frequently about corn that is imported from some of the states to the south of us, and this seed seems to be favored by a great many because it can be bought at a low price. We are not in that class. Our seed corn is of value, and we can and will get a fair and reasonable price for it. Our greatest need at present is the spreading of information showing the value of our corn for seed purposes, and showing where it has an increased value over other corn.

Chatham feels that the Ontario Corn Growers' Association has bestowed a distinct honor upon her in holding this meeting here this year, and it is our sincere hope that we may have the honor again at no far distant date.

Permit me at this time to express my personal appreciation of the efforts that have been put forth by the officers of the organization to make this gathering the success it is, and to compliment them upon the success of their efforts. Were it not that they have an abiding faith in the supremacy of King Corn, and in the future of the western counties and a public spirit not easily surpassed, they would not

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devote the time and work necessary to bring into form an exhibition of such magnitude and finish. It is a pleasure for me to extend to you the freedom of the city.

Permit me to repeat that I consider it a great honor personally to be permitted to welcome such a representative gathering, and on behalf of the city of Chatham and all its citizens both great and small, I bid you a most hearty welcome, and trust your stay amongst us will not only be full of pleasure but also of profit and that for years the remembrance of this meeting will be fresh in each mind.

ADDRESS.

G. W. SULMAN, M.P.P., CHATHAM.

In opening, I wish to state that the success of the Fair fully warranted the efforts that have been made to secure a grant from the Government for the Exhibition. The success of the Exhibition would more than repay the people who have worked so faithfully to make it go. I am glad that Hon. Mr. Duff has visited Chatham and has seen the Show for himself, and I am sure that when the directors go to the Government again, they will have no trouble getting an increased grant for the work of the Association.

In speaking of the work of Dr. Creelman I would say that of all the men in that line of work he has no peer. He is enthusiastic over his work, and that in a very large measure accounts for his success in it.

You cannot be a success in any walk in life unless you are enthusiastic over your work. All of the great men of the ages gone by have been men who have been enthusiastic. Take for instance one man, Marconi; it was only through enthusiasm that he was able to discover wireless telegraphy. Take Alexander the Great; it was enthusiasm that lead him to conquer. No matter what you do you have to be enthusiastic in order to succeed. No matter whether it is corn, alfalfa, or any other crop, you should be determined to grow the very best, and if the proper enthusiasm is displayed, the results will come and they will be satisfactory to you.

ADDRESS.

HON. JAMES S. DUFF, MINISTER OF AGRICULTURE, TORONTO.

I am very glad to have the privilege of attending this Show and of addressing this audience. I was very pleased this afternoon in taking a walk through the Exhibition with Dr. Creelman and others, to see the exhibits, and while I do not know as much about it as the judges, still I know it is a very creditable show. I have been asking those who have been watching the progress of the shows, and I find that it is the consensus of opinion that the shows are improving. I am sure that this show indicates that this section of the Province is the great and only corn growing country. It is bringing the people to have higher ideals of the different varieties of corn and the culture of it, and I am told that the exhibits this year are much better than they have been in any previous year. This shows progress, and I am sure that it is a very encouraging sign. And I am also assured that if the farmers of this peninsula are true to their opportunities, there is no reason why this should not become the great seed producing district of the Dominion.

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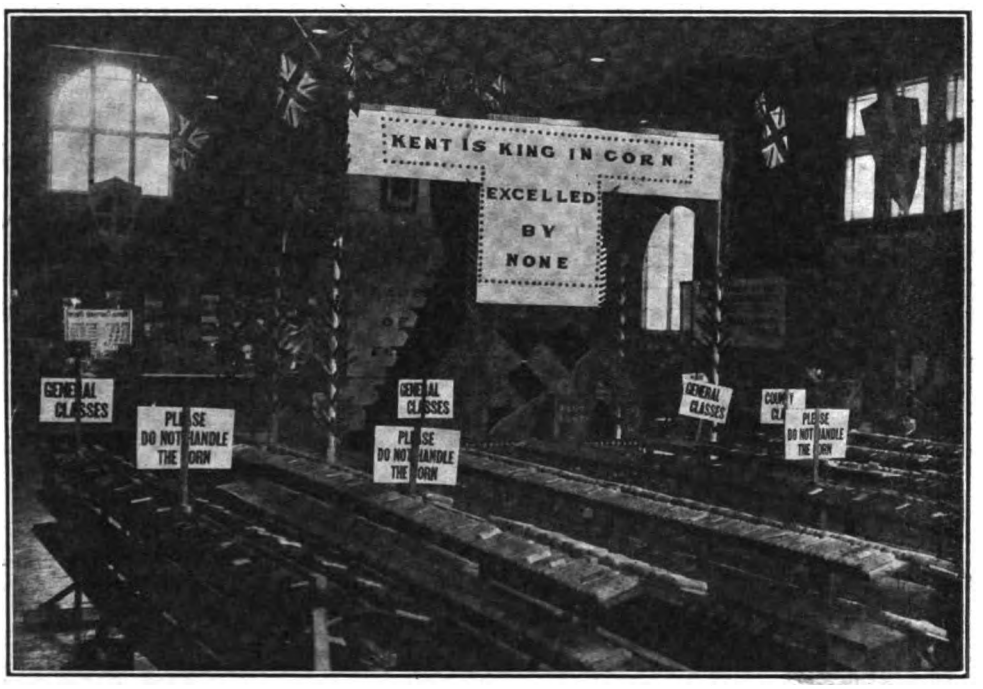
Some people are inclined to say that Western Ontario has no connection with Western Canada. The culture of corn fodder, however, is getting to be a great business in Manitoba and the West. Two years ago I went out to the West and saw an old friend who went there twenty years ago. We drove out to his farm and there I saw forty acres of corn on the 20th of July which was as good as anything you might wish to see. The reason there are not many silos is on account of the severity of the climate, which is not adapted to the extensive growing of corn. They have one advantage in that country, however, as they are able to cut their corn with a binder, put it up in stocks and go out with a team and sleigh and haul it in, with no fear that it will freeze and then thaw. They are not up against the changing conditions in the weather that the eastern farmer has to contend with.



A View in the Armouries, Showing in the centre the Kent Centre Farmers' Club Exhibit.

If the farmers of this south-western part of the Province can make this the great seed producing district for corn, they can do the same thing with alfalfa. I would like to see it done.

The work of this Convention and the Corn Exhibition shows that the Government is amply justified in making an appropriation from year to year.

In moving around the Province I generally request the people to tell me the outstanding features of the agriculture of the districts I visit, and I must say that it has been an eye-opener to me to visit this corn growing part of the Province—this banana belt. To one like myself, who lives in the northern part of the Province, it is indeed an eye-opener to come to this district where you scarcely have any winter as compared with the rest of the Province. Tobacco and other lines of crops grown by you are entirely foreign to us in the north.

After all, what is the farmer striving for? The young man should find out what his farm is best suited for. It may take time, but once he is convinced he

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should go ahead, taking the bitter with the sweet, with the goal of success constantly in view. If he does this there will be no doubt of his success.

The farmers who are not so much in love with farm life are those who have not hit upon the proper way of managing their farms. There is no calling quite so honorable, independent, or where the avenues are so remunerative as farming. It is an indisputable fact that the farmers of the country have a higher average of wealth than any other class of people. Farmers do not think enough of themselves. Because they are farmers they think they are only farmers, and they forget the fact that if there is any one man who should hold up his head as one of the aristocracy of the land, it is the farmer. What other class of men have the same independent life? You can commence work and quit whenever you like. If you want to quit for half a day you can do it. At the same time you have an opportunity to live on the very best of the land at the actual cost of producing it. What other class of people have the same opportunities day in and day out to breathe in the fresh air, with no thought of the difficulties of ventilation that arise in the ordinary walks of life in the cities?

I feel more, however, that if farmers are to secure success they must be fond of the soil, of their farms, and fond of animals. They must feel that their farm is the most wonderful spot on earth; and if they do this, even if they remain on the farm all of their lives, there will be no doubt of their success.

To-day we are worried over the fact that the boys are leaving the farm, and you ask me how will we keep them on the farm. You can't keep a boy on the farm unless he wants to stay, unless he has a love for the farm. A man's success in the business or professional world lies in the fact that he is all bound up in his work. He is proud of his occupation. This is necessary on the farm as well as it is in other branches of life, and it is more warranted on a farm than in any other place.

The farmers should throw more responsibility on the shoulders of their sons. Give them some special work to look after; take them into partnership, and after a while the boy will not be telling his friends that his "father" does things a certain way. He will say that "we" do things this way and that, as he will feel that he is really in partnership with his father. In that way he will get an interest and a love for the work.

Two years ago I had a young man come into my office in the Legislative building. He was well dressed, and he said he wanted to talk over a certain propaganda with me and ask my opinion of it. He said he was employed by one of the Hearst papers. The proposition was to get people back to the land. He said you know the cost of living is high and it is caused by the falling off in the production. The farms are not properly worked, and they are, in a large number of instances, being abandoned. His idea was to take the boys out of the city and plant them on the farms that have been abandoned. In Vermont, Maine and other eastern states, he said, you see many abandoned farms. Where have the farmers of the country gone? They have flocked to the cities and towns. Why? They got the lure of the city thinking they would be able to make more money. In the cities they find that they are out of employment, and his idea was to see that the abandoned farms are occupied by the young men of the cities. I said to him, "Why don't you take one of these abandoned farms yourself?" He thought I had cut him rather short, and the interview ended rather abruptly.

That is one of the great troubles. The men who are talking about going back to the farms are not the ones who are acting by taking the lead in the matter. But there is an inducement on the farms to-day that did not exist years ago. There are greater financial possibilities on the farms to-day. Hogs, cattle, sheep, cheese, butter, everything has gone up with the exception of the cereals.

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In the last thirty-five years we have been making a great mistake. We have had a great industrial prosperity. Factories have been busy and the industries flourishing. Times have been good, money has been plentiful and wages high. There has been an opportunity for the men to leave the farms and improve themselves. The consumers have grown in a larger ratio than the producers. We will never see the low prices of farm produce prevail again in this country.

We must improve the soil. We were in the position that the western wheat grower will be in in a few years. We had been mining the soil without putting anything back on it. We have ceased to do this, and now the farmers are feeding the grain grown on their farms, and they are buying feed as well. This will enhance the value of the soil and enrich it.

The thing that has made the Ontario farmer so prosperous is the fact that he has an enormous home market. It is a wonder the amount of cheese, butter and other manufacturers' produce that is brought into the country as well. It is not that we manufacture less of it, but because the home market is so big that we cannot ourselves supply it.

There is a duty that we all owe to each other. We cannot all be farmers. It would not be well if we could. What is that duty?

W. H. Moore, of "The Canadian Farm," at a banquet of the stock men given during a recent convention, made a speech in which he said, "We are a great community, and if we are great we must realize that we have something in common." That note should be the motto in the mouth of every farmer. Take Chatham. What kind of a place would this be to live in if there were no rural district surrounding it? Take away the farming, and what about these cities and towns in this district? Reverse the situation, and you will also see that the farms could not be as good without the cities and towns. Each is necessary to the other as you will readily see. If there is anything that these shows ought to do it is to bring about a community spirit between those who toil on the farms and those in the city, that cannot be brought about in any other way.

Less than a hundred years ago there were very few settlements in Ontario. Some exceptional spirit actuated our forefathers, and they have built up for us a Province, the growth of which has never been equalled in any other country. If we are to continue to develop and keep up the pace, we must do as we did in the past, and feel that in this land of ours it shall ever be said that "man to man shall brothers be."

We have a history that we should be proud of. The life of the late Lord Strathcona should be an inspiration to every young Canadian. Coming to the coast of Labrador at the age of eighteen years he was continuously connected with the development of Canada. At fifty years of age he met the half breeds and Hudson Bay factors at Winnipeg, selling Rupert's Land in 1869 to the Government. He had a lot of trouble, but it was finally settled. Many doubted the wisdom of the sale for $300,000, but look to-day at the farms in the west with which we are linked up. We are drawn closer to the Great West as we are more thoroughly connected with that great country. Their cattle and their goods are coming east so fast that a slump was caused in the hog market when nineteen cars arrived from Winnipeg. The interlinking of our trade is something to foster.

On behalf of the Ontario Government I am delighted to know that this Corn Exhibition is such a great success, and also that the Government is doing all in its power to foster this prosperity through the District Agricultural Representatives. The work of the Agricultural College was never appreciated as it is to-day. It is in constant touch with the Agricultural Representatives like Mr. McKenney and

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Mr. Edwards. These men are agricultural missionaries working in the interests of the farming people of the Province, giving higher ideals of farm life and giving out the thought that it is a grand thing to be a farmer.

I congratulate the managers of the present Fair, and hope the success with which you are meeting will continue to grow from year to year and that the Show will continue to get even better than it is.

SOME RURAL PROBLEMS.

DR. G. C. CREELMAN, PRESIDENT ONTARIO AGRICULTURAL COLLEGE, GUELPH.

Perhaps there never was a time in the history of Ontario that there was as much need for instruction in Ontario as at the persent day.

Farming and farm operations have changed so materially that the father cannot now give the best and most up-to-date instruction, even to his own boys.

Wheat is now but one of our minor crops, while corn and sugar beets, and alfalfa, and peaches and apples and onions, and tomatoes and tobacco are coming to be counted among our staple crops.

The climate of Ontario seems to be adapted to the growing of so many varieties of crops that there is no reason why the farmer's daily life need any longer become monotonous. Ontario has changed her methods with the new order of things, and owing to the superior intelligence of her people has established herself as one of the best farming provinces of the whole world.

Notwithstanding the great development in our Western Provinces the field crops of Ontario yet almost equal in value all the field crops produced in Canada west of Winnipeg, in spite of the fact that a large percentage of the Western farmers have been drawn from Ontario farm homes.

As one goes through this Province from county to county, and township to township, he is forced to the conclusion that as an agricultural district it is very highly favored indeed. Good land, well watered, and excellent climate with plenty of sunshine, always insures fair crops; and while our bank managers in their annual statements often forecast good or bad times, according to the conditions of the crops in the West, yet because they have never been disappointed in Ontario crops they never speak of what might happen if we had a failure here.

In this favored Province, therefore, one would expect to find farming the most popular business of all, and the people from cities and towns would only live in such places until they could make money to own and operate a farm.

As a matter of fact the situation is exactly reversed. Farmers' boys and farmers' girls are leaving in large numbers, for the cities and the towns, and most of the farmers themselves hope to remain on the farm only as long as will enable them to make money which at 3 per cent. will give them sufficient income to retire to the neighboring town or city. Here they hope to pass their days in peace and idleness, to sleep late in the mornings, and sit up late at nights, in fact to "eat, drink and be merry" all the rest of their lives.

You know as well as I do how differently it works out. The farmer has as much right to retire after a life of hard work as anyone else, perhaps more so, as he is one man who has earned every dollar he has made. The difficulty is that he does not know the difference between the life of the producer and the consumer, the circumstances with which he will find himself surrounded when he gets out of his own element.

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Speaking of retired farmers, it seems to me that the great pity lies, not so much that he does not fit into his new conditions, but that his long experiences, his habits of thrift, his knowledge of the community, and his leisure time, are now all lost to the neighborhood in which he has done all of his work, and in which position he should be able, in his declining years, to do a great deal of good.

You know perhaps better than I do how much clear-headed, conscientious, broad-minded help is needed among the school boards in our communities. You know what one man of the right sort could do with a little leisure in improving the appearance of the school and the conditions of the school grounds. You know what can be accomplished by such a man coming forward in the support of the teacher, in the introduction of modern methods, and you know how much a man

Boys Judging Corn in Inter-School Competitions at Chatham, 1914.

should stand as a strength in the community, and could very easily secure additional funds each year for the purchase of those little things, in the way of additional school equipment that makes the difference between the mere humdrum of teaching by text books and teaching by demonstration.

We Must Start Early.

If, then, the coming generation of the farmers are to be kept in the country, are to be expected to settle on a corner of the old farm after they have turned their larger property over to the son or son-in-law, then we must start very early to interest the boy and the girl in the ethics of rural living. The farmer's boy must be encouraged to play in a systematic way; he must be taught to co-operate with his neighbors in everything; he must be instructed in the first principles of scientific farming; he must be encouraged to read widely and persistently. He must be taught to draw as well as to read and write, and he must be encouraged along the

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line of his talents to do everything systematically that his latter days on the farm may lead to neatness about the buildings and fences, orderliness in the barns, stables, harness rooms and the implement sheds, shorter hours for men and teams, the desire to adopt new methods which have been proven to be the best at the Colleges and Experiment Stations, and the readiness to change from one method to the other, on the advice of the best farmers in the community.

All such ideas must be inculcated in youth, and as the parents are now asking for more help from the Agricultural College, the boy will get more encouragement at home than would have been the case a few years ago.

The Agricultural College during its existence of nearly forty years has proven by experiment surely and definitely that farming certain fields in a certain way, that breeding and feeding certain classes of live stock, that introducing certain crops on certain soils, that handling the orchard by certain methods, and by draining the land in a certain way, absolute success in farming is secured.

From that point, however, we have not done all that we should in getting this information to the individual farmer at his own farm.

We have at present over 5,000 farmers conducting experiments on their own farms and reporting to us, but there are over 200,000 heads of families on farms in this Province whom we reach but indirectly.

Helping Farmers on Their Own Farms.

As a matter of fact the difference between the average and the possible yield on the ordinary farm is about 300 per cent.

I think it would be quite within the mark were I to say that our Agricultural Colleges and Experiment Stations had already proven by experiment enough facts to double the output on the ordinary farm, if put into actual practice.

The whole trouble has been that we have not been able to get the farmers to adapt these facts to every day work on the farm.

For instance, alfalfa is worth pound for pound as much as bran for feeding live stock. We can, and do, produce five tons of alfalfa hay per acre in the ordinary season in Ontario. Bran was worth last week $24 a ton, which would make the alfalfa crop actually worth to the farmer $120 per acre, and yet it is the hardest kind of work at times to persuade farmers who have suitable land, to risk ploughing up even an old pasture to put into alfalfa.

The average cow in Ontario produces less than 3,500 lbs of milk per year, and yet we had a cow in the College herd that produced 20,778 lbs. by actual weight in twelve months. This is a difference of nearly 600 per cent.

The average hen in Ontario lays less than 100 eggs in a year, while last year we had whole pens that produced 180 eggs; and the best 256 eggs.

And so I might go on, but the very telling of these things does not help you to produce this kind of a hen, or cow or crop.

We were a long time finding this out, but now we have come finally to the conclusion that the best and quickest way to improve the farming of this Province is to actually send trained men into the country and leave them there long enough to get the confidence of the people.

Such men we have termed Agricultural Representatives, and we have now one in each of forty districts in this Province, and they are all doing excellent work. They have already accomplished a good deal through holding short courses for farmers, longer courses in High Schools for farmers' sons, introducing pure seed, starting Farmers' Clubs, giving plans for farms or drainage, starting school fairs, judging at local exhibitions, taking old orchards and regenerating them, and

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making them produce good fruit, helping in the selection of improved tools and machinery, helping to conduct experiments on different farms, and a thousand and one other activities according to climate, soil and latitude. I want you to watch the operations of these men and note the progress they are making, because I believe they are going to wield a greater influence on the future prosperity of Ontario than anything else that has ever been attempted.

School Teachers.

But the science men in the High Schools and the Collegiate Institutes and the Public School teachers themselves in the common schools must teach this new agriculture, if it is to be taught universally. It was with that object in view that we have opened our doors to the teaching profession, and from the letters being received from day to day it would look as though this has been a move in the right direction.

I am not so sure that the rural teachers and rural preachers may not have to take Agricultural College courses yet so that they may learn to teach and preach morals and religion to farmers in terms of their daily life.

The Agricultural Representatives will work among the young men and the older men in active co-operation with the schools at the same time, so that there may be no conflict in the subject matter, or in the methods taught.

Farmers' Problems.

These of course are many, as they are in business of any kind, but at the present the following seem to stand out as being of most importance.

1. The killing of weeds.

2. The planting of varieties of crops best suited to the farm and the neighborhood.

Our extreme south-west should devote most of its energies to growing corn and beans and poultry and early fruit and vegetables.

The Niagara Peninsula to fruit growing and truck farming.

The shores of Lake Ontario, Lake Huron and Georgian Bay to apples.

Eastern Ontario, generally speaking, for dairying, and Western and Northern Ontario for general farming and live stock.

3. The securing of better and more permanent farm help.

I would send our best farmers, such as Farmers Institute workers and judges of live stock, to Great Britain to hold meetings and show photographs of our fields and orchards, cattle, sheep and homesteads. We need all the farm help we can get, and perhaps we could do with fewer so-called mechanics, Jacks of all trades.

4. Marketing our crops by co-operation with our neighbors that we may get the most possible for our labor.

This is a question which has occupied the attention of political and social economists for many centuries. It has gained little ground among farmers in this country but has dominated the whole system of farmers in some of the countries of Europe.

In Denmark and parts of Germany co-operative methods have given the farmers charge of the banks, the telephones, the railroads, and even the Governments. Money may be had at from two to three per cent., and the poorest citizen, if he be honest, has the same chance to promote his business and sell his goods in the best market as has the largest farmer in the land.

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In America it looks as though our farmers will be forced almost to the wall, our farms worn out, and our land desolate before we give up our small jealousies and our petty suspicions of one another.

With so many people rushing from the country to the city, and so many people coming into our cities from foreign lands, it is not surprising that prices of all food stuffs are dearer. Fewer people producing and more people consuming easily accounts for the present conditions of high prices.

The question then arises, how may we with more mouths to fill and inefficient as well as insufficient help, meet the increased demands?

The College and Experiment Stations have done their part, and have done it well. They have by experiment proven absolutely many things that if put into general practice would easily double our present output. They have taken a certain number of students from towns and cities and country places and have taught them the best known methods of farming.

I think it is only by union among ourselves that every farmer on his own farm may obtain certain information at first hand, not only as to raising a crop but the marketing and transporting and delivering of it to the customer.

The Improvement of Roads.

5. This is absolutely essential, and I am now of the opinion that some school of Practical Science must put on a course of instruction of road making which must teach draining, draining, draining, before metal or cement are thought of at all.

6. The securing of electric power on the farm. This is coming very fast. Besides the actual saving in animal power, what an uplift it will give the home life, to have electric light in every room of the house, barn and stable. At present farmers work so hard that they have a poor chance to enjoy the light of day, and at night a poor light to enjoy the chance of reading anything. Think also for one moment the difference running water makes in a domestic establishment.

7. We want more shrubs and perennial flower beds and tennis courts and time for play, that the farm life may be the envy of the young people of the city and town.

I am convinced that it is not the glare and glitter of the city street that attracts boys and girls to the city, but rather the lack of social organization in the country where every healthy young man and woman may have some exercise and entertainment and amusement in the furthering of which both sexes may take an active part.

This is most important. Plowing, sowing and reaping and mowing and doing chores may be exercise enough, but it is not the highest kind of entertainment and youth must be served.

Better Schools.

9. In the old country I find that the aim of education is to make a "well dressed man who reads books and speaks correct English." In Canada he must also work for a living, therefore he must have special training. In country places our young people are practically all intelligent, temperate, frugal and industrious. That accounts for our young men adapting themselves to any walk of life when they go to our cities or to the United States, and our girls who practically control and manage the large hospitals of this continent.

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What about the country boy and girl who remain at home? We have made a start. Five hundred young men took instruction in agriculture from our Agricultural Representatives this winter, and nearly one thousand more attended short courses at the College. Some school teachers have taken courses at the agricultural College. When all rural school teachers have a good working knowledge of agriculture, I predict a great awakening in rural affairs.

I believe that as many men go to perdition each year from bad cooking as from strong drink. Ninety per cent. of all our women do their own work. Every girl then must be taught how to cook and to sew while her time is not worth much that she may economize time when it is valuable. Flour and sugar and salt are three of our most necessary foods, and yet they are cheaper than twenty years ago.

If it takes 1¼ cents to make a five cent loaf of bread in Toronto and 1¼ cents to deliver it, then half of the cost of the staff of life was saved by our mother's baking. Why don't our wives bake now? They would if they knew how.

Many musicians and artists and essayists we have tried to make and perhaps in the making some goods cooks have been lost.

Conclusion.

You say "Why bother us city people with your rural problems?" Because you are specialists in organization and we are not. We are willing to do the work but we don't know how to get it. We could use an extra million dollars right now to demonstrate and put into practice what we already know.

We want rural architects to show us how to lay out and plan our homesteads and to get running water into our houses. We want a model mile of good road in every township. We want travelling teachers of agriculture and travelling teachers of cooking and sewing in every district. We want a weed killing and good seed campaign in every county.

We want more orchards sprayed and lessons in apple packing and pre-cooling fruit houses and egg circles, not here and there but everywhere, and we want them now.

Please excuse my impetuosity, but my heart is in the work and we need the help and sympathy of every thoughtful citizen.

We want as many instructors and experimenters and demonstrators in each county to look after the better breeding and feeding and nourishing and improving of crops and animals as we now have doctors of medicine. Then our farmers who are already intelligent and temperate and industrious will produce for you more and better food and put it on the market where the consumer can get it in such an attractive condition that canned vegetables and dried fruit and black sausages and last year's eggs will all be forced out of competition, and your wife will with confidence, bred of knowledge, take the greatest pride in personally manufacturing or personally superintending the manufacturing of your bread, your biscuits, your cakes, your cookies, your sauces, your salads, your jams, your jellies, your preserves, and your pancakes, all because you have come to your senses and insist that vocational training is sensible and necessary training for boys and girls. The training of country children must be different from that of city children, but the proper training of each is essential to the best success and happiness of the Canadian man and woman of to-morrow. And perhaps in the end country people will lose their jealousy of their neighbors in the cities and towns, and the town people will come to appreciate more and more the economic as well as the social value of the farmers to the credit and benefit of both.

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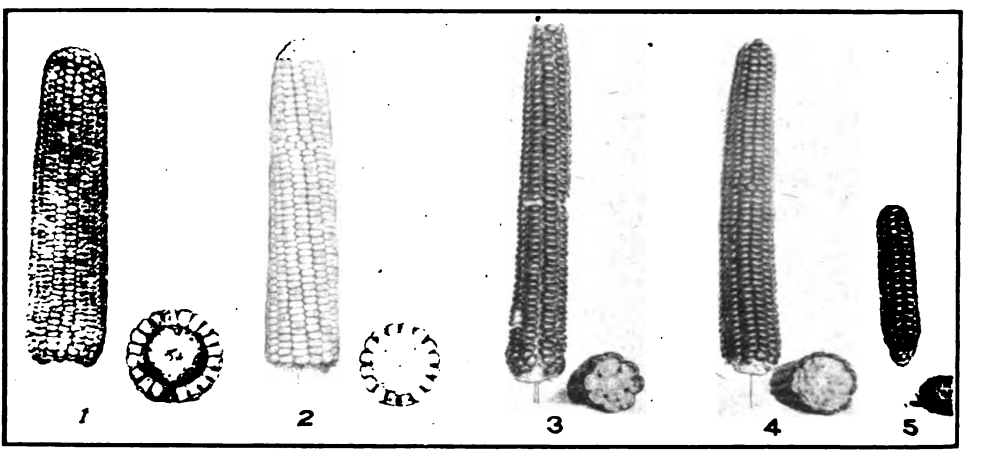
THE PRODUCTION OF SEED CORN OF TYPES REQUIRED IN EASTERN ONTARIO AND QUEBEC.

L. H. NEWMAN, OTTAWA.*

One of the first aims considered by the Ontario Corn Growers' Association from the beginning was that of building up a trade in seed corn with the dairy farmers of eastern Ontario and Quebec. At each succeeding Corn Show this phase of the Association's work has been dealt with at considerable length. It would appear, therefore, that there is little to add to what has already been said, although each year brings with it its quota of new observations and conclusions. My remarks to-day will refer in part to certain experiments which have been conducted in the eastern townships of Quebec during the past season and which seem to indicate the types of corn most suitable for growing for ensilage purposes in that part of Canada.



Showing types of Corn from different zones in Canada.

Corn is a heat loving plant, it therefore attains most perfect development in southern districts where it produces a large leafy stalk, with a large thick ear covered with deep kernels. When planted in a more northerly part, the habit of growth gradually changes, the stalk becoming more leafy near the ground and the ears being borne at a lower point on the stalk. The kernels likewise become shallower in response to the tendency of all Nature to produce mature seed. Ears producing kernels of great depth have not sufficient time to attain perfect maturity in the northern districts, hence the tendency is to produce a shallower kernel. The ability of corn to respond readily to environment is greatly aided by its hybrid character. As is well known, corn cross-fertilizes very readily, with the result that the average corn field is composed of many different strains, which each year again become cross-fertilized with each other, making the hybridity more and more complex. When the environment is changed these combinations (ears) which are most suited to thrive under the new conditions are selected for the following year's seeding. This process being conducted from year to

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year, a cumulative effect is produced, until it is possible to change the type almost completely within a very short time. The result of this fact is that we have to-day in Canada many different types of corn, and roughly speaking we can divide the corn growing sections of Canada into five main zones on the basis of type as follows:

The first zone may be said to occupy all land in Canada south of the 43rd par. of lat., which runs almost through Sarnia, London and Welland. In this zone practically all of the so-called Dent varieties will mature, the later types in Essex and Kent and the earlier varieties as we approach the northern limit of the zone.

The second zone may be said to lie between the 43rd and 44th parallel of latitude, the latter extending across Western Ontario almost through Mount Forest and eastward across Prince Edward County. In this district an earlier type of Dent predominates as a result of man's experience in finding such types more reliable from year to year.

The third zone may be said to lie between lats. 44 and 45, the latter extending across Ontario from near Bracebridge running south of Cornwall and constituting, for a few miles, the southern boundary of the eastern townships of Quebec. In this region only the very early Dents are to be found and these are grown only seldom for grain, being used especially for ensilage purposes. In this zone, which we might designate as No. 3, such varieties of Flint as Longfellow, Salzer's North Dakota and Compton's Early are grown very largely for grain, while the Dents are grown chiefly for green fodder or ensilage.

Zone No. 4 may be said to lie between lats. 45 and 46, the latter extending from about the mouth of the French River across Ontario and Quebec, running north of Pembroke and across the St. Lawrence near Sorel. In this zone only the very earliest Flint corns may be relied upon to mature their grain practically every year. Such varieties as Quebec Yellow have given about the best results, especially in the northern part of this region. It may be said that Flints are grown almost exclusively for grain north of lat. 44. This region takes in about twenty-six counties in Ontario and all of the corn growing sections of Quebec. Farmers find that while they cannot mature grain of the heavily stocked and leaved Dent, types which are grown so largely in southern latitudes, that they *can* grow more feed units per acre by growing this type of corn and putting it in the silo where it can be preserved even though the grain has not thoroughly ripened. The area now growing corn for ensilage north of lat. 44 is almost 50 per cent. of the total area of corn grown. The seed of these ensilage sorts must be obtained from the southern districts, where the corn usually matures thoroughly. As has been pointed out on the occasion of former meetings of this Association, it has been a common practice among eastern farmers to purchase from dealers who in turn very often secure their supplies from the United States. This seed will mature and germinate well, having had a longer season to mature and being more thoroughly dried, and therefore of more reliable vitality. These at least are the reasons given by our dealers who in the past have preferred to purchase their seed corn from our American neighbors. They tell us that they believe the types of corn grown in South-western Ontario are more satisfactory for growing in the eastern part of Ontario on account of being earlier, yet they have had difficulty in procuring seed which they could depend upon for vitality from this

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part. This situation, I am happy to say, is gradually being improved in that a number of good corn men in Essex, Kent and some of the other counties are gradually tackling this problem with considerable success, and are gradually building up a good trade with eastern growers. The farmer in the east, on the other hand, is also coming to realize that it is not always the most luxuriant appearing corn which will give the greatest amount of food value per acre, and are finding out from experience that the earlier types produce a larger proportion of grain to fodder and that this increased proportion means a more valuable food for their stock.

During the past season a number of interesting experiments have been conducted on a few farms in the eastern townships of Quebec under the direction of Mr. Carl Sweet, of the Seed Branch of the Department of Agriculture, Ottawa, and to whom I am indebted for certain samples and data which I wish to present this afternoon.

Four Flint varieties and six Dents were tested near Hillhurst in Compton County on the farm of one of the so-called "illustration" farmers working under the direction of the Commission of Conservation. The seed of these varieties was obtained from Essex County and may be said to be represented by these samples (indicating). The crop produced from this seed was excellent in so far as foliage was concerned, but the production of grain as well as the quality of the grain as shown by these samples (indicating) was of a low order. An examination of the data submitted shows that the ears of Flints shrank on the average 79. 5 per cent. from Sept. 16th to Nov. 7th, while the Dents shrank 84.15 per cent. during the same period. The total fodder produced by the Dent varieties including the ears shrank 48.9 per cent. during the same period as above mentioned, thus:

Wisconsin No. 7 yielded 20.08 tons of green fodder, including the ear, and shrank to 11.01 tons in three weeks' time, that is 45.1 per cent. This variety also produced 3.27 tons of ears per acre, but these shrank in three weeks to .48 tons, thus making a shrinkage in the ears of 85.3 per cent. by weight.

Golden Glow yielded 20.69 tons of green fodder, but shrank to 9.92 tons in three weeks or 52 per cent. The ears produced at time of cutting weighed 3.32 tons, but in three weeks had shrunk to .6 tons or 82 per cent.

Early White Cap produced 18.63 tons of green fodder, which shrank to 9.8 tons, or 47.4 per cent. The ears produced weighed 2.35 tons, but in the above period shrank to .3 tons, or 83 per cent.

Early Leaming produced 21.03 tons, which shrank to 10.04 tons, or 53.3 per cent. The shrinkage in the case of this variety was over 8 per cent. more than that of the Wisconsin as regards total yield. The shrinkage of the ears was also slightly greater than that of Wisconsin, being 86 per cent.

From these figures it will be seen that on this particular farm Wisconsin No. 7 gave the greatest food value per acre. It is of course quite unwise to accept one year's work as at all conclusive. We must rather regard this data as suggestive.

On another farm in Mississiquoi County, near Bedford, Que., there were tested the following five varieties of Dents, namely, Wisconsin No. 7, Early White Cap, Golden Glow, Early Leaming and Early Bailey. The original seed was obtained from Essex County in the spring of 1913. The progeny of this seed is represented in these samples (indicating) as being much better developed than

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were the ears on the farm just mentioned. The figures submitted with this test are hardly comparable with those just discussed, as the weights were taken at different times. However, we may make certain deductions, as to the relative standing of the varieties grown in that particular district.

Wisconsin No. 7 yielded 14.9 tons per acre, but by January 22nd had shrunk to 4.42 tons, or 70 per cent.; the ears produced weighed 5.5 tons, but had shrunken to 2 tons or 63.6 per cent, by the above date.

In *Early White Cap* the ears weighed 4.8 tons per acre when cut, but on January 22nd had shrunken to 2.42 tons, or 52.2 per cent.

Early Leaming produced 5.8 tons of ears, which shrank to 2 tons by January 22nd.

On October 2nd, 1909, I collected samples of Mastodon, Reid's Yellow Dent, Early Leaming and Compton's Early from a field grown for ensilage purposes in the Ottawa district. These samples were weighed when picked, and weighed again on the 5th of the following April, when the shrinkage was found to be as follows:

Mastodon	70.0 per cent.
Reid's	79.3 per cent.
Leaming	50.4 per cent.

The weights for Compton's are missing. An examination of the samples, however, will give you some idea as to their relative feeding values, and also shows that one must not be deceived by mere bulk. When the ears were picked they were quite full and attractive in appearance, but have now shrunken to mere chaff.

The proportion of corn to fodder by weight is of course very much greater in the case of corn grown on this farm than that grown in the former test. In the test under consideration, 44.4 per cent. of the total weight of crop is made up of ears which are represented by this sample (indicating). In the case of the experiment first discussed, only 4 per cent. of the total weight is made up of ears and these were of a quality which did not add much to the value of the fodder. The difference in the development of these two sets of experiments on the different farms may be attributed to different conditions of soil and to cultural methods. They indicate clearly that the eastern grower can do a very great deal by way of cultivation, etc., to insure a paying crop.

The Production of Seed Corn.

During this and previous Corn Exhibitions we have heard the best known methods of corn breeding explained in detail. I need not repeat therefore what has already been told. The C. S. G. A. is very much interested just now in procuring in considerable quantities for the trade, better bred seed corn of types suitable for the purposes just described. The work of the Association divides itself automatically into two phases, namely, the educational and the commercial. Our educational activities concern themselves chiefly in the encouragement of individuals who do not grow seed corn for sale in any considerable quantity, but who are anxious to grow the very best types of seed on their own farm year after year and who are interested in the systematic selection of their seed. To such men we aim to give every encouragement. We want him to take a pride in his work and in his stock. We believe that a knowledge of the essentials

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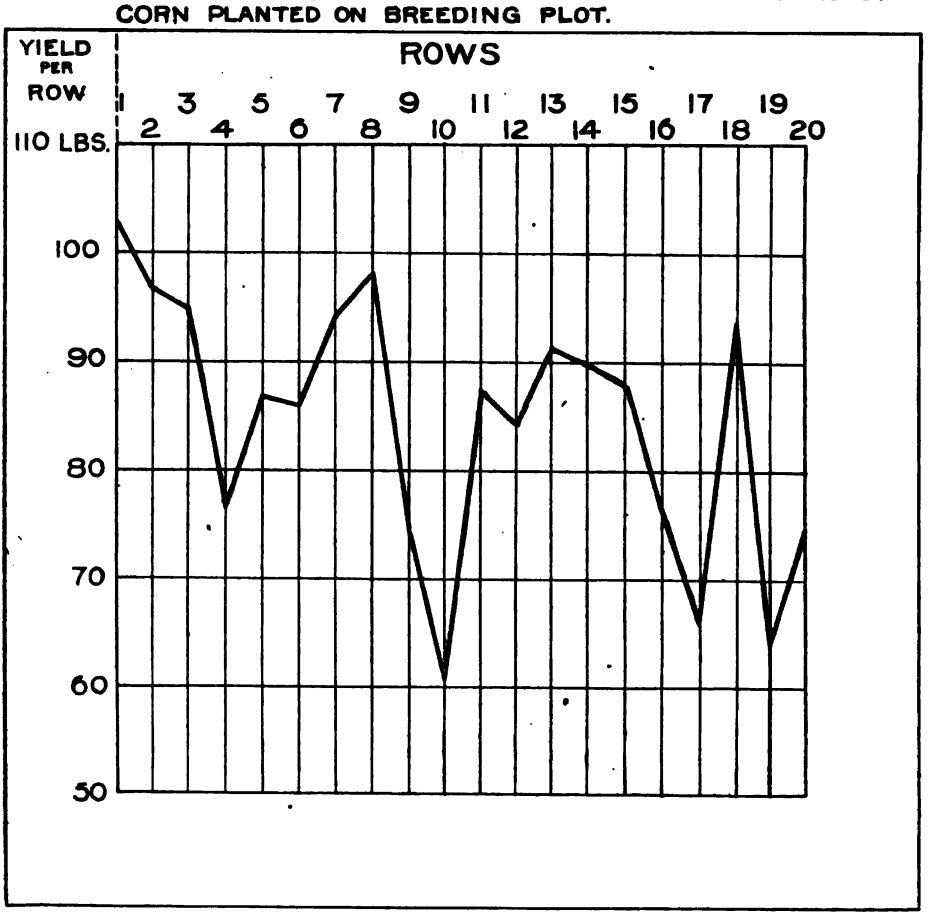
of breeding and a rational application of those principles would do much to create a greater interest in the matter of corn growing and in fact in farm work in general.

Our interest in the commercial side is based on a desire to have more and better seed corn used by the average farmer, and incidentally to provide through the use of such seed visible demonstrations as to what good seed really means. To this end the Association has recently initiated the plan of establishing what

GRAPHIC EXPRESSION SHOWING VARIATION IN YIELD OF EARS OF CORN PLANTED ON BREEDING PLOT.



we call "Seed Growing Centres," in each of which an outstanding type may be propagated in a large way and the seed made available to the buying public. The method of breeding followed is essentially the same in principle as that which has been outlined on this and former occasions. It has for its basis the "ear to the row" idea, that is the value of an ear for seeding purposes is determined by its performance record in the row to which it has been allotted. During the years we have practised this system we have observed that it is not always the fine looking ear which gives best results when put to the test. The real object of corn breeding is not to obtain simply fine looking ears but rather to isolate and perpetuate ears from high yielding strains, be they attractive or otherwise. Yield in all classes of plants is a product of many factors, a fact which

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explains in part at least why we must not allow ourselves to be carried away by the so-called "ideal" ear. The score card, corn exhibitions, etc., have their place, but their true place must be fully recognized and not unnecessarily exaggerated.

Until recently the C. S. G. A. required each individual grower to operate a special seed plot and to select certain seed ears for his next year's plot from the best rows and from the best plants within the row. This, we still think, to be a good plan for the individual grower who is interested chiefly in obtaining seed for his own particular farm or where he is multiplying his stock on a fairly large scale, and can therefore offer the trade a considerable quantity of seed which will behave uniformly under given conditions. On account of the ease with which corn responds to selection, and to the fact that very considerable quantities of certain types of corn are often wanted by the trade, we are gradually introducing the plan of *having one member do all of the selection work for a certain district* with a given type. This stock is then propagated by a number of careful growers situated on adjoining farms where possible, and who have constituted themselves a "seed growing centre." Were each grower in such a centre required to operate a seed plot and to make a selection of seed ears each year, it is hardly conceivable that the type obtained from each grower would behave the same way when grown under certain conditions. Rather might one expect to find a motley mixture of types, either as regards appearance or behaviour or both. This seed centre arrangement which concerns the commercial aspect of our work particularly, will, I think, solve the problem of producing large quantities of corn of a standard type year after year and will enable purchasers to come back to the same source for their supply each spring. Any group of farmers who wish to take up the growing of registered seed corn might organize themselves into a seed corn centre in the manner described and have one of their number do the selection work under the supervision of an expert. By carefully following their rules and doing their very best there is no reason why they should not make the growing of seed corn a lucrative business under present conditions. Our Canadian Seed Growers' Association, the Ontario Corn Growers' Association, the District Representatives of Agriculture and other interested individuals and institutions, all I am sure, will be glad to combine to make the efforts of any responsible seed centre a success.

As mentioned at your meeting last year, I am personally of the opinion that there is a need for a special corn expert to control the breeding and testing of the different types of corn not only here in this part of Ontario, but in the east and in Quebec. I hope the powers that be will soon see fit to appoint such an expert, but until they do so I can think of no better plan than that which the C. S. G. A. is at present encouraging, and which I have briefly outlined this afternoon.

CORN GROWING FOR SEED AND SILAGE.

C. P. Norgord, Professor of Agronomy, Wisconsin Agricultural College, Madison, Wis.

I am very pleased to come to south-western Ontario, especially as I find the people here are just the same kind of people as we have in Wisconsin. It is hard for a farmer who has lived all of his life on a farm and who has made a success of farming to take advice from younger men on the question of farming.

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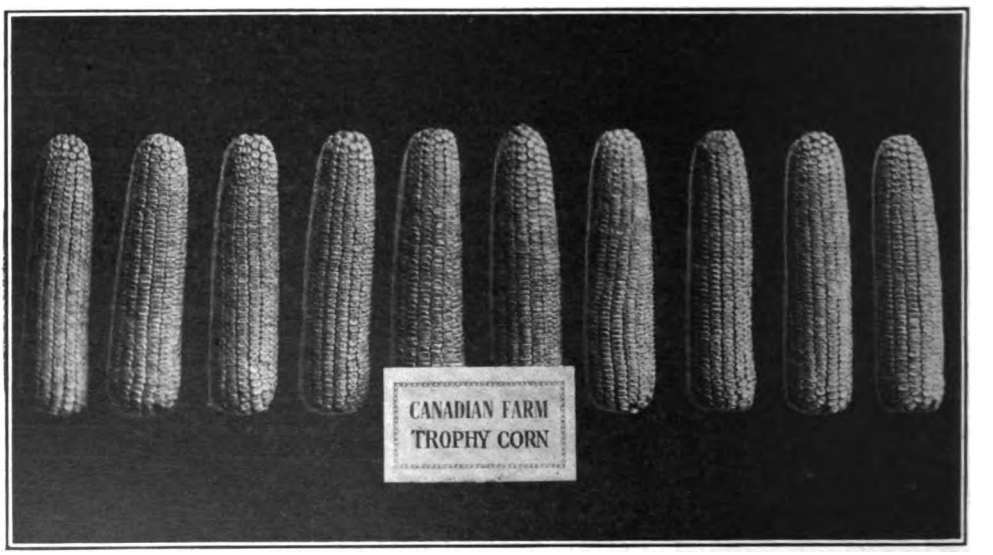
This, however, is a wonderful age, and it has been found that a man who has lived all of his life on a farm cannot during his lifetime secure all of the information that it is possible to get on farming. You might say to a younger man, "You tell us what to do; can you tell us how to do it?" It has taken 25 years of talking to Wisconsin farmers to make them receive information gladly. They have now been receiving instruction willingly for some time and the results are being shown in the farm work. To-day you are not receiving the information from practical farmers, but from those who have made a study of the science underlying agricultural pursuits. There are a great many things to learn. Farmers must prepare for farming the same as a lawyer or doctor is prepared to practice his profession. By a diagnosis of the soil we find out what is wrong, and the diagnosis of the land is a scientific subject just as deep as the diagnosis of a disease in a human being that afterwards turns out to be typhoid fever.



Best 10 ears of Corn in Show. Wisconsin; grown by Mr. Kramer, Walkerville.

Every science we know belongs to the fundamental things of agriculture. The young man on the farm has a great future before him. This is a new age with new competition, and if he prepares himself and if he studies along the right lines of work the same as a doctor does in his profession, he has a great future before him.

The farmers are receiving the message of better farming and a study of the sciences of farming better than they ever did before, which is a very hopeful sign for the agricultural industry.

Coming to the subject of growing corn for silage, you cannot talk of corn without also talking of silage. Corn is pre-eminently used for silage. There is more dry matter per acre and a larger percentage of digestible dry matter in corn than in any other crop. In digestible qualities timothy has 1,410 pounds of nutrients to the acre; clover has 2,240, corn, 2,722, and silage, 4,080. This has been shown to be true by experiments.

When coming through this country I did not see many silos going up. This is a matter that will stand a great deal of emphasis at this time, as there is

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nothing more important on the farm. Silage is a wonderful feed, and is a great food for the fattening of stock.

Experiments were carried on in the Indiana College of Agriculture to prove this point. Two steers were taken. One was given a ration of corn and clover hay, and the other rations of corn silage. The profit per steer fed clover was $3.37, while the profit per steer fed silage was $20.96.

This is hard to realize but it is a fact. In you own experimental station at Ottawa, experiments have been made with this feed and it was found that by feeding roots and clover hay the stock gained 1 and 5/100 pounds a day, which shows a superiority of silage over even roots as a feed for fattening stock.

Then take the production of milk from silage as compared with fodder. In New Jersey experiments were made with silage and fodder, by the latter meaning the stalks and ears, and the silage including the stalks and ears. It was shown by experiments that silage corn as feed produces 12 per cent. more milk. Corn should be taken from the field on the first of October. When it is left in the field until November it deteriorates one-quarter in feed value.

I have noticed fields around here where the only thing taken off the field is the ears. This is a great waste as the corn stalks when used with the ears in silage is wonderful feed.

I notice that there are a great number of roots grown here. These are used instead of silage, but it has been shown that corn silage is better than roots as a feed for stock. This is an established fact, and not the result of a series of opinions. Corn contains more dry matter than roots, and it is possible to raise twice as much dry matter with corn as it is with roots. This makes it twice as good as a feed. From experiments it has been determined the amount of dry matter in these various crops. From a hundred pounds of dry matter in corn it has been proven that there are possible 119 pounds of milk. From 100 pounds of dry matter in roots there are possible 113 pounds of milk, which is a very good showing in favor of ensilage.

We hear the argument presented against silos to the effect that the odor from the silos finds its way into the milk, and that the ensilage loosens the cows teeth and causes tuberculosis. Cheese men say that the odor from the silo gets into the cheese through the milk. In the matter of Limburger cheese I should think that would be a good thing. But the odor does not get into the milk through the cow. If the odor gets into the milk it is because the silo door has been left open during the milking and the odor gets out into the barn. Milk is a great absorber of odor, and thus it might absorb the odor from the silo, but this can be overcome by feeding the cows after they have been milked, so that the odor from the silo has no chance to get into the barn.

Alfalfa is a good thing to mix in the silage if it can be grown in this country. I am informed that there are 175,000 acres in Ontario suitable for the growing of alfalfa. Peas and beans put into the ensilage would create an odor and they are not as desirable as corn.

Soy beans and corn are the best things for a mixture of ensilage. Plant them at the same time, cut the soy beans when the corn is ready to cut, and the ensilage will be perfect. The beans grow in Wisconsin from two and a half to three feet high.

A VOICE: I have grown soy beans as high as your head.

PROF. NORGORD: You are fortunate to be able to do so. I would advise you to use the crop as silage.

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Through using corn for ensilage and feeding it to the cows it gives the milk a nutritious flavor that our forefathers were only able to secure from their cows in the spring of the year. It makes the seasons into a spring all the year round in the dairying business. The wonder is how the dairymen got along without it before they knew of it.

It is also surprising to know what a small area will fill the silo. I farm myself, and have a silo of 100 tons, and all the corn it takes to fill it is a small strip along the creek of the farm. Six acres fill this 100 ton silo. It is a common thing to grow from 15 to 20 tons of ensilage corn to the acre. Some people, however, will fill their silos with five acres of corn and others will require 20, and there may be only a wire fence dividing the two farms.

What makes this difference? It is nothing more than the stand of corn. I have been surprised to meet the number of men who do not realize the importance of the stand of their corn crops. It is a simple thing to test out the germination and possible stand of corn crops. Take for instance 300 kernels in one row. If every kernel grows, there will be three hundred plants which will make 100 per cent. germination and a perfect stand. I have seen rows of corn with 90 per cent., 75 per cent. and 60 per cent. stands, and the farmers cannot tell because they do not count the stalks. They just size up how it looks without getting down to count the stalks. I have determined stands that are much lower than the farmers think they are. If you have a 60 per cent. stand, you will only have a 60 per cent. yield. Farmers should count the hills and find out what is the average.

The curing of seed corn is very important. Here are charts of experiments to show that the fire dried corn is the best. Some of these experiments show that corn cured on the walls of buildings only had 34 per cent. germination. Corn cured in cribs 37½ per cent. germination, in barns, 69 per cent.; in granaries, 54 per cent.; under porches, 70 per cent. and in attics where there is plenty of ventilation, 70½ per cent. An attic with but one window is a poor place for curing corn, as the dampness gets in and there is no draft to dry the corn. Where there are two windows it is much better.

I know a man who cured his corn on the south side of a pump house. It was of the Silver King variety. We took a sample of it and planted 300 kernels of it in a row and also 300 kernels of fire dried corn of the same variety right beside it. We found that the fire dried corn produced 85 and 7/10 bushels to the acre, and the pump-house dried corn 41 and 7/10 bushels to the acre, a difference of 44 bushels.

With good seed and good care it is possible to raise wonderful crops of corn. In Wisconsin one man was known to raise 133 bushels of shelled corn to the acre, so it will be seen that there is a future in the business if the proper methods are used.

The farmer who had lost 44 bushels to the acre through poor curing on the side of a pump house had to admit that as a result of his poor methods he was losing $22 per acre. He had 30 acres in corn, so that he lost on his crop that year the sum of $660, which is a considerable sum.

An interesting home made rig for curing corn is a piece of wire fence cut so that the ears of corn can be stuck on to the wire and hung up where the air can get all around it. I have noticed that many similar contrivances are already in use in this section of the country.

What is the time to start drying the corn? The farmers want corn with

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many leaves for curing. The seed corn should be picked when it is standing in the seed plot. It should not be left overnight in a basket as so often is done, for mould will set in in one night and injure it. It should be placed on the racks as soon as possible after it is picked. It will not hurt corn to freeze after the moisture is dried out of it. If one cell is burst the corn is killed. There are always some ears that will not germinate. It pays a farmer to germinate his corn carefully. In 800 kernels there are 800 ears of corn. In 800 ears there are eight bushels of grain which amounts to $4 at feed prices. So that for every ear that does not germinate the farmer loses $4. That is surely proof of the fact that it is desirable and profitable for a farmer to test his corn before planting.

We cannot control the rain and heat, but we can control the insect pests, and we can pay attention to the curing and germination of the corn, and it is our duty to look carefully after the things over which we have some control.

Soil fertility and the rotation of crops is very essential. The people of the past few years have been soil robbers to a large extent. If the fertility of the soil is to be maintained, the proper rotation of crops will have to be observed. In Holland great attention is being paid to this, with the result that they are experiencing great results in keeping the land fertile. Science is answering that problem. Farsighted men saw the time coming when this problem would come up, and they guarded against it by conducting experiments that are of use to us to-day in making the land fertile. It was shown that the best rotation of crops for the land is corn, oats and clover. In thirteen years' experimenting with this rotation it was shown that the land retained a capacity of producing 81 bushels of corn to the acre.

It is possible to improve the corn breeding the same as it is to improve the breeding of cattle. Six samples of corn were selected for an experiment, two years ago on a demonstration farm. One produced 40 bushels to the acre, another 32, another 73, another 44, another 73, another 79. When they were all mixed up the yield per acre was 57½ bushels to the acre. By selecting three of the highest the yield per acre was 75 5-10 bushels to the acre, a difference of 18 4/10 bushels to the acre. There is then a great difference in the yielding powers. Farmers have not always the time to conduct these experiments, but that is the work that the agricultural colleges are doing for them. The experimental stations are established for doing this, and it is a work of years to arrive at the best varieties to send out to the farmers to grow on their farms.

I am not here to transport things from Wisconsin, but we have no one in the States more capable of doing this work than Prof. Zavitz. This work means millions of dollars to the farmers. I would advocate a careful eradication of the barren stalks from the fields. It would require years of work to accomplish it, but it is worth it in the end.

A VOICE: It took six years to eradicate the barren stalks from my field.

PROF. NORGORD: I am glad that you are engaged in the work.

I cannot tell how long it would take to eradicate barren stalks. It would depend largely upon the condition of the various crops to be worked upon. Barren stalks are not always caused by breeding. It may be caused by splitting of the cells through freezing, by allowing the mould to get a start, or by exhausting the ground by growing too many crops of corn in consecutive years. The seed may also be injured through poor care and poor curing.

There is a large percentage of water in the corn in the milk stages. Great

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care should be taken not to place the corn in the silo when it is in the milk stage. There is considerable sugar in the corn in the milk stages and this turns into alcohol and vinegar in the silo and has an evil effect. This sugar in the corn turns into starch when it is ripe, which is nutritious. Many people have shunned the silo for as long as twenty-five years in Wisconsin, through making this mistake on the start. If you do not succeed at first keep on trying, and you will eventually succeed.

Ensilage is fine for fattening sheep, and in Montana they have secured wonderful results in this respect. I would not say that it is a good horse feed, but I would say that it does not hurt the horses in small quantities if they are used for working. With cattle, however, it shows up at its best as a feed. It is pre-eminently a feed for fattening cattle and other stock, with the possible exception of hogs.

The farmers hate to see the golden ears of corn going into the silo when as a matter of fact that is the most profitable way they can use it on the farm. The more ears put into the silo the better the feed, and the better the results. Wisconsin No. 7 is good corn for ensilage, as is also Golden Glow. It has been proven by experiments in New York that the best results are obtained from the corn crops by putting ears and all into the silo, when the ensilage is used as feed for cattle.

The beauty of the silo is that when the frost comes early and kills the corn for seeding purposes, the whole crop can be put into the silo and its value as ensilage is not destroyed by the frost. It is better to have a covering so that the heat will be retained and the silo will not freeze up into one solid mass. There is no other necessity for having a covering for the silo. The acid in the corn stops the work of all bacteria. Corn has been cut two weeks after being killed by frost, and it has turned out to be good ensilage.

In conclusion I wish to say that the silo is the best building on the farm, and makes corn an absolutely sure crop. I would not be a dairyman without a silo. I would not be a dairyman unless I were in a corn belt, and the silo is the thing that makes the location in the corn belt a desirable thing in the interests of dairying.

ESSENTIALS FOR SUCCESS WITH ALFALFA.

PROF. C. P. NORGORD, PROFESSOR OF AGRONOMY, WISCONSIN AGRICULTURAL COLLEGE, MADISON, WIS.

Alfalfa is the one model food. It is the balanced ration, and through its use the best results can be obtained in dairying and the fattening of beef and pork. It is undoubtedly the coming crop in this country for feed. It has been a long time in getting started, but they are growing it now in all parts of the country, and it will not be long before it will be an established crop in Canada as well. It is necessary to get familiar with the problems of alfalfa-growing before it can be raised successfully. People who go in for it should know and believe the essentials for growing it.

The reason that alfalfa is such a profitable crop is because it has the highest percentage of dry matter of all crops. Alfalfa has more dry matter than corn. It has 4,480 pounds of dry matter per acre. Dry matter is the digestible matter

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which has a feeding value. It has a very high percentage of protein. The comparison is as follows:

Alfalfa	1,996	pounds	of	protein	per acre.
Clover	661	"	"	"	"
Timothy	224	"	"	"	"
Brome Grass	158	"	"	"	"

Protein has a value in building up the muscles of the body. Therefore alfalfa is of great value in producing milk, in fact, it is the greatest known feed for the production of milk as it contains a balance of protein and starches.

I will give you the results of an experiment in which 80 steers were fattened by various processes to find out what was the best feed for them. One lot was fattened on oil meal and corn, and the other alfalfa and corn. It was shown during the experiment that the alfalfa was just as good as oil meal for fattening purposes, and it is very much cheaper. The alfalfa does the fattening and the corn produces the other necessities.

People now buy cotton seed meal, oil meal and bran for producing milk in cows. Some also use brewers' grains. Here is another experiment in which 4½ pounds of brewers' grains and 4½ pounds of bran were used, as against 17 pounds of alfalfa. They produced 126 3/10 pounds of milk with the alfalfa and 127 3/10 pounds of milk with the feed ration mentioned. They secured 1 and 5/100 pounds of butter from the alfalfa, and 1 and 13/100 pounds of butter from the feed ration. So that ten pounds of alfalfa is equal to nine pounds of bran and oil meal. This is a pretty good comparison and shows what a valuable crop it is especially when it is considered how much cheaper it is than bran and oil meal.

Experiments at Mexico showed that 246 pounds of alfalfa will produce 100 pounds of milk, so that 46 pounds of alfalfa will replace 50 pounds of bran. Through a series of comparisons and facts I can show that through raising alfalfa a farmer could realize $100 an acre in feed value. What could you afford to pay for land, then, to grow alfalfa. $100 an acre would pay the interest on land at $2,000 an acre. We have not yet got to $2,000 an acre land, and I hope they never will, but the figures show that alfalfa is certainly a paying crop for the farmers to raise.

Alfalfa is next to silage for keeping the cows in good condition, and it goes with the latter as a feed. It is also good for fattening sheep, but I would not advise that it be fed to horses that are being worked. It would be all right for brood mares and horses that are not being worked, as it would brighten up their coats and put them in good fat condition.

The question is, "Can we raise it?" We have raised it on all kinds of soil—sandy clay lands, black loam, etc. The things you need for the successful growing of alfalfa are that the land be well drained, it must have fertility and tilth and must have surface as well as under drainage.

The location of the land is a very important problem. It is a very tender plant, and will not grow on land where there is standing water, or where there is water standing near the surface. Sloping land is good. I am talking from an experience of seven years in growing alfalfa both on my own farm and upon experimental farms. It will not grow on land that has a water table three or four feet from the surface. We must have good underdrainage. We must have good tiled land. Alfalfa grows very deep and it must not have wet feet.

We must also have the presence of bacteria in the soil. I did not believe this seven years ago, but it is true, or else you must add a tremendous amount

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of manure. Alfalfa takes more nitrogen from the land than any other crop you can grow. There is not one piece of soil rich enough to furnish enough nitrogen without adding fertilizer.

While the soil has not enough nitrogen for the growing of the crop from year to year, the air has, and we have a method of converting that nitrogen into a solid and spreading it over the land. We also do it by means of bacteria that secure the nitrogen from the air and put it into the soil. By experiments with alfalfa on experimental farms we have found that when the alfalfa is a dark green it has the nitrogen, but if it is a light green it is being underfed with this nitrogen. We planted one field that was inoculated with bacteria and got a crop of five tons to the acre. Another field that was not inoculated only produced 1½ tons and the third year we had to plow it up as the crop was not worth harvesting. This can be substantiated by the work done at our stations, and it goes to show that bacteria is necessary in the soil if the alfalfa is to be grown successfully.

A VOICE: If you grow alfalfa one year, would not the manure serve to inoculate the field for the second crop.

PROF. NORGORD: If you are feeding the alfalfa the manure would probably inoculate the field for the second crop.

A VOICE: Which is better, a ton of bran or a ton of alfalfa?

PROF. NORGORD: Bran is better. The percentage of protein in bran is 15, and the percentage of protein in alfalfa is 14.

A VOICE: What about pasturing?

PROF. NORGORD: It is rather tender for pasturing. The cows injure it.

A VOICE: How do you get the bacteria? Is it true that the same bacteria is on sweet clover and that if you use this soil you can inoculate for alfalfa?

PROF. NORGORD: Yes. The next thing is how to get the bacteria in the soil. We can get it in by means of artificial cultures. You can get the preparation to spread over seed. You put the culture on the seed and allow it to remain over night and it dries and multiplies. That has not been a uniform method, however, and does not always prove satisfactory. Artificial cultures are a help, but you should not depend on them alone. It should be reasonable to inoculate ten acres for 75 cents. The sunlight kills the bacteria, and you must be very careful to keep it away from the sunlight in using it. Some manufacturers sell it at $2 a can, when as a matter of fact the real value of the amount they sell is only two cents. The United States colleges are sending free to farmers bacteria to inoculate their farms. The Michigan Station is sending out a large amount and the Wisconsin Station also sends out a large quantity of it. It is used with other methods, and is the easiest way of inoculating the fields. When the soil is transferred, sometimes there is a danger of transferring disease at the same time.

A VOICE: Will alfalfa inoculate itself? If you sow two or three pounds of alfalfa with clover, will it become inoculated?

PROF. NORGORD: You must have the bacteria in the soil for the clover. All fields are inoculated because they grow clover.

A VOICE: Will these fields remain inoculated?

PROF. NORGORD: I have known of instances of bacteria in the soil once producing a successful crop which would not grow alfalfa when it was sown the second time.

Then the question of how to put it in the soil should be answered. The

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simplest way is to go to a place where there is sweet clover, dig down six inches and transfer this soil to the field before you put in the seed. Put the soil on the field on a cloudy day and then harrow it over and bury the bacteria in that way.

A VOICE: Would you not have a crop of sweet clover at the same time?

PROF. NORGORD: Yes, but this crop of sweet clover would go off the first year.

A VOICE: Is alfalfa hard to get rid of?

PROF. NORGORD: Yes; you must have a good sharp plowshare. The roots, however, bring up the fertility of the subsoil and make the soil rich.

A VOICE: Will it stop up the underdrainage?

PROF. NORGORD: Not very much. There have been a few instances where it had clogged up underdrainage, but the danger is not serious.

A VOICE: Do you need a rotation with the crop the same as clover?

PROF. NORGORD: Yes; but you need a longer rotation. A five year rotation is used with great success, three years of alfalfa, one year of corn, and one year of grain.

A VOICE: Would it be profitable to grow alfalfa for one year?

PROF. NORGORD: No.

A VOICE: Did you ever sow alfalfa with a nurse crop?

PROF. NORGORD: A nurse crop of barley is good, about a bushel and a half to the acre. If the necessary bacteria were in the soil the alfalfa would live until the nitrogen gave out.

A VOICE: If a few plants were inoculated, would it spread?

PROF. NORGORD: No, the bacteria grows on the roots already there. You have to plow it in order to spread it.

A VOICE: Do you get the bacteria by sowing sweet clover?

PROF. NORGORD: No.

In speaking of sowing alfalfa with a nurse crop of, say, barley, the barley would take up the water and the alfalfa would share the nitrogen of the land with the nurse crop. As soon as the barley were cut off, the alfalfa would be robbed of the shade to which it has become accustomed, and the farmer might lose the stand. I would advise sowing it in the month of July without a nurse crop. If you like you can put in a crop before the alfalfa. You can put in peas, rye, wheat or early barley. Then if you fail to get a stand of alfalfa all you would be out would be the seed and the labor of the alfalfa, for you would have already have reaped a crop off the field that year.

Alfalfa came from Persia and Babylon to the United States through Mexico. It stopped at the Mississippi Valley and the Atlantic Coast. This was caused by the fact that it struck acid in the soil. You must not have a sour soil for alfalfa. To test a field to find out whether or not it has acid, go to a drug store and get a piece of blue litmus paper and put it in the ground. If the paper turns red then there is acid in the soil. In order to get rid of the acid add lime to the soil. Alfalfa is better if you use lime on the soil. Common slack lime should be used, and it should be put on a ton or two to the acre. Slack lime will burn the soil if it is practised too long, however. One or two applications would not hurt the soil. The sugar beet factories have a lime that has gone through the factory that could be used for this purpose with very good effect.

A VOICE: Could you sow alfalfa after the first cultivation of corn?

PROF. NORGORD: Yes, it is good that way.

Alfalfa should be cut when the new shoots commence to grow from the

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crown and the blossoms begin to appear on the outside of the field. Care should be taken to keep the leaves. They fall off very easily, if they are handled, when they are dried too soon. The leaves contain 24 per cent. protein and form 60 per cent. of the feeding value.

Alfalfa should be cut in the morning or the evening. In the afternoon of a good hay day it will be found that the leaves of the alfalfa are wilted. The hay should be put in bunches, and it should be covered up with hay caps made of sheeting which can be secured for 12 cents a yard. It should be kept for four days in the field. If you have large areas it will not pay to handle it that way. It should be left there so it will sweat and dry.

A VOICE: Can you cut it and put it in the barn the same day?

PROF. NORGORD: It would not pay to do it.

A VOICE: Well, then, come to my barn and I will show you where it does pay to do it.

PROF. NORGORD: Well, if you come to my barn I will show you where it didn't pay me to do it. If it is put in before it has an opportunity to dry it will sweat, and mould will set in.

Prof. Zavitz has in a talk to the farmers mentioned some good varieties of alfalfa that were profitable to grow. Variegated is good, and Grimm's Alfalfa is also very good. We get the best results from Grimm's Alfalfa, but it would pay you to get the seed that has been grown on dry areas.

CROP IMPROVEMENT FROM THE FARMER'S STANDPOINT.

C. A. ZAVITZ, PROFESSOR OF FIELD HUSBANDRY, ONTARIO AGRICULTURAL COLLEGE,

The members of the Ontario Corn Growers' Association, while particularly interested in corn, are also interested in other farm crops. It would be rather serious if this were not the case. In order to grow corn with the greatest amount of satisfaction it is important to have a good rotation of crops, to equalize the work throughout the season, to secure a variety of winter feed for farm stock, and to keep up the fertility of the soil in an economic way; hence, the production of various crops is practically essential. To furnish an opportunity for considering some of the best methods of crop improvement is the object of presenting this address at this time. I invite discussion throughout, but ask that you keep very closely to the subject in hand.

IMPORTANCE OF UNDERDRAINAGE.

One of the first and important considerations in improved crop production is the proper drainage of the land. Crops cannot be grown to their highest state of perfection on land that requires underdrainage; in fact, in many instances it is one of the great regulating features of high or low crop production. It is not the intention to go into this matter in detail in this address. I wish, however, to state that the Department of Agricultural Physics at the Ontario Agricultural College is furnishing the farmers of Ontario with important and substantial aid in regard to underdrainage. During the last ten years the Department has sent men over the Province to survey farms and furnish the owners with charts

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showing the best position for the drains, the size of tile, the depth and the distance apart of the drains, and the approximate cost. This is done at a very small expense to the farmer, and to the advantage of not only himself, but of the whole neighborhood. Any farmers wishing information on underdrainage should write to the Department of Agricultural Physics, at the Ontario Agricultural College, Guelph.

Rotation of Crops.

It is exceedingly important for each person to adopt on his own farm the rotation of crops which is likely to give the best results to meet the conditions of the farm and the requirements of the system of farming. While it is true that no one rotation is the best under all conditions it is equally true that certain underlying principles should be used as much as possible in each rotation. The rotation should be so arranged that the crop of each year would not only be the suitable crop for that season but would also in some way or other form a preparation for the crop of the following year. A crop such as corn, roots or potatoes when carefully cultivated assists the following crop by the destruction of the weeds, and by liberating plant food. The grain crops should be sown in such a way that they not only furnish good results themselves, but make good nurse crops for seeding with grasses, clovers or alfalfa. The leguminous crops such as the clovers and the alfalfa not only furnish a large amount of nutritious food, but also improve the mechanical condition of the soil, and also add to the soil some of the free nitrogen of the atmosphere, and thus improve the land for the crops following. Any person who has not given the subject of crop rotation his careful thought and attention has not lived up to his opportunities in making use of one of the best features in high crop production from an economical standpoint.

Varieties of Farm Crops.

In the first place it might be stated with a great deal of emphasis that there are far too many varieties of farm crops grown in Ontario at the present time. It is one of the weaknesses of the agriculture of the Province. I believe, however, that a change is taking place and that in the very near future the number of varieties will become perceptibly reduced. In a number of classes of farm crops such as oats, winter wheat and potatoes larger yields would be produced, the crops would be of better quality, and the market prices would be higher if only a few of the very best kinds were used in cultivation. Much better satisfaction would also be realized by growing only the very best varieties of corn, mangels and alfalfa. In the case of pasture crops, however, the opposite is true. Too many farmers are confining themselves to timothy for their old pasture fields, and timothy makes a poor pasture in a dry season. A mixture of some of the hardy varieties of grasses which are more prolific than timothy in the dry seasons would sometimes save a heavy loss. It will, therefore, be seen that careful attention should be given to the varieties of crops which are grown on the individual farms. It would probably be well to draw special attention to a few of the varieties which have made high records in recent years, and which will likely be grown extensively in the near future.

The oat crop of Ontario occupies nearly three million acres of land annually, and produces a crop which is valued at over thirty-six million dollars per annum in the average of the past ten years, and which had a value in 1912 of over thirty-eight million dollars. It will, therefore, be seen that an average increase

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of one bushel per acre in the yields of the oat crop of Ontario would make an increase in the value of the crop of about one million dollars. An increase of one dollar per acre in the oat crop would add nearly four million dollars to the value of this one crop in Ontario in a single year. A difference of five per cent. in the percentage of hull of oats if applied to the oat crop of the Province would make a difference of nearly two million dollars per annum. I wish to call your particular attention to these facts when considering the importance of two varieties of oats, the results of which are to be considered.

Realizing the great value of the oat crop in the Province of Ontario a large amount of work has been done at the Ontario Agricultural College at Guelph with the object of securing better varieties. This line of investigation has included both selection and hybridization. Two varieties which have been started at the College through selection have been used not only in the tests at the College, but also in the co-operative tests of the Experimental Union. Both varieties have done exceptionally well.

It is possible that the O. A. C. No. 72 oats, which were originated at the College through selection, may take a somewhat similar position in oat production in Ontario as the O. A. C. No. 21 barley has in the barley production of the Province. In the spring of 1903, about ten thousand grains of the Siberian oats were planted separately at equal distances apart in a large nursery plot. This gave the separate plants an opportunity for development so as to bring out some knowledge of their individuality. When the grain was ripe the plants were all carefully examined and those possessing the most desirable characteristics were harvested separately and carefully stored. These selected plants were given a more critical examination in the plant breeding laboratory and those possessing the largest amount of the best seed were retained for future work. In the spring of 1904, a certain number of the seeds from each of the plants were planted by hand in separate rows, which furnished an opportunity for a study of the characteristics of the progeny of the individual plants. A critical study was made of these different strains and only the best were continued in the test. As the results of this careful investigation it was found that what is now called the O. A. C. No. 72 seemed to possess the greatest combination of the most desirable characteristics.

The O. A. C. No. 3 variety of oats originated from a single plant selected from the regular variety plot of the Daubeney oats in the year 1904. The writer at the time selected a number of plants which gave the appearance of combining some of the most desirable characteristics of an early oat. These plants were threshed separately and the grain was carefully retained for future work. After careful tests were made it was found that the oats which now receive the name of O. A. C. No. 3 proved to be the best.

The following table gives the average of seven years' results in height of crop, number of days to mature, and tons of straw per acre, as well as the results for 1913, and the average results for seven years of the percentage of hull and the yield of grain per acre of the O. A. C. No. 72, and the O. A. C. No. 3 oats in comparison with the American Banner and the Black Tartarian, two old standard varieties:

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Varieties.	Average results for seven years.			Percentage of hull		Bushels of Grain per acre	
	Height of crop in inches	No. of days to mature	Tons of straw per acre	1913	Average seven years	1913	Average seven years
O. A. C. No. 72	44.9	111	2.17	25.6	27.3	105.74	89.08
O. A. C. No. 3	40.3	101	1.81	23.0	24.2	94.12	86.61
American Banner	41.6	111	1.90	29.2	30.3	74.38	67.39
Black Tartarian	40.1	114	2.04	28.8	30.4	60.56	58.45

In the average results of the seven years' experiment the Vick's American Banner and the O. A. C. No. 72 oats ripened at the same time, but the O. A. C. No. 3 variety is exactly ten days earlier. It will also be noticed from the average results that the O. A. C. No. 72 variety possesses a large amount of straw, giving fully one-quarter of a ton per acre per annum more than the Banner variety.

The detailed results show that in percentage of hull the Vick's American Banner was the highest and the O. A. C. No. 3 was the lowest in each of the seven seasons, the average for the O. A. C. No. 3 being 24.2, for the O. A. C. No. 72, 27.3, and for the Banner, 30.3. It will, therefore, be seen that each one hundred pounds of O. A. C. No. 3 contains six pounds, and each one hundred pounds of the O. A. C. No. 72 contains three pounds of oat kernel or oatmeal more than the same weight of the Banner variety. The quality of oats is a factor which is too frequently ignored in oat production.

In yield of grain per acre the results are very striking. In every year the yield per acre of the O. A. C. No. 3 and of the O. A. C. No. 72 considerably surpassed the yield of the Banner. In the average of the seven years' experiments it will be seen that the Banner was surpassed by each of the other two varieties by upwards of nineteen bushels per acre per annum. The two new varieties, each of which were originated eleven years ago from a single seed, have certainly made excellent records in producing very large yields of grain of superior quality.

The O. A. C. No. 72 oats grow to a good height, the plants usually stand up well, and the straw is abundant and of good quality. The head is spreading in its habit of growth and both the straw and the grain are of a pinkish white appearance. The pinkish color of the crop is usually quite noticeable in the ripening grain in the field, and generally shows more or less distinctly after the grain has been threshed. The oats are of good quality, having only about 27 per cent. of hull, which is less than the Banner by 3 or 4 per cent., less than the Tartar King by about 7 or 8 per cent., and also less than most other varieties. The yield of both straw and grain per acre has been large in the comparative results, both at the Agricultural College and in the co-operative experimental work throughout the Province. The O. A. C. No. 72 variety of oats was distributed for co-operative experiments in 1911, when it surpassed the Siberian, the Regenerated Abundance, and the Lincoln, producing an average of five bushels per acre more than the last named variety. The O. A. C. No. 72 oats were not used in the co-operative experiments in 1912, but in 1913 they surpassed each of the other three varieties by at least 8.8 bushels, in the average of 187 experiments.

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The O. A. C. No. 3 variety of oats possesses a straw of medium height, and which is less susceptible to lodge than that of most other early varieties. The heads are spreading in their habit of growth, the grain is white in color, and the average weight per measured bushel is about the standard of thirty-four pounds. The kernels are rather long, and the percentage of hull is exceptionally low, being less than all other named varieties which have been under experiment at the Ontario Agricultural College within the past twenty-five years, and which now number fully three hundred. The crop matures exceptionally early, and is frequently harvested before severe storms occur which often cause the later varieties of oats to become badly lodged.

The O. A. C. No. 3 variety of oats is a large yielder of grain and a medium yielder of straw. Its very high yield of grain of exceptionally good quality, and its early habit of maturity makes the O. A. C. No. 3 not only a desirable variety to grow by itself, but a most suitable variety to grow in combination with a heavy yielding six-rowed barley such as the O. A. C. No. 21 variety, with which it would ripen satisfactorily.

Barley is one of the important crops of the Province, usually giving a larger number of pounds of grain per acre than is obtained from oats. According to the best authorities barley contains more digestible food constituents than do oats, weight for weight. These two points should be taken into careful consideration by farmers when making their decisions in regard to the class of crops to be grown. Of all the varieties of barley which have been under experiment at the Ontario Agricultural College at Guelph, and in the co-operative experiments throughout Ontario the O. A. C. No. 21 has made the highest record. As near as can be ascertained about ninety-five per cent. of all the barley of Ontario consists of the Mandscheuri or the O. A. C. No. 21 varieties. The Mandscheuri was imported from Russia, and after being thoroughly tested at Guelph was distributed for co-operative experiments. The O. A. C. No. 21 was started from a single plant selected in 1903 from a nursery plot of about ten thousand plants of the Mandscheuri variety. After showing its excellent qualities it was distributed through the medium of the Experimental Union, and now is the most popular variety of barley in many of the localities of Ontario.

The rye crop in Ontario has increased considerably in recent years. Winter varieties usually produce a larger yield of grain than those which are sown in the spring. Of the different varieties which have been under experiment at the College and throughout Ontario the Mammoth White has given the largest yield per acre for several years. Of the spring varieties the O. A. C. No. 61, which was started from a single plant selected from the Petkos variety of rye, which was obtained from Germany thirteen years ago, has made decidedly the highest record of all the different kinds of spring rye under experiment. The O. A. C. No. 61 has made a fine record in the co-operative experiments throughout Ontario as well as at the Agricultural College.

The area devoted to buckwheat in Ontario has increased more rapidly in the last few years than that of any other class of grain crops in Ontario. The rye or rough buckwheat has proven to be decidedly the most prolific in the various experiments conducted in the Province. Its cultivation is likely to be increased considerably during the next few years. Although the hull may be a little thicker than that of the Silver Hull variety, and the flour of a slightly yellowish cast, these objections do not seem to be serious. The straw of the rough buckwheat is

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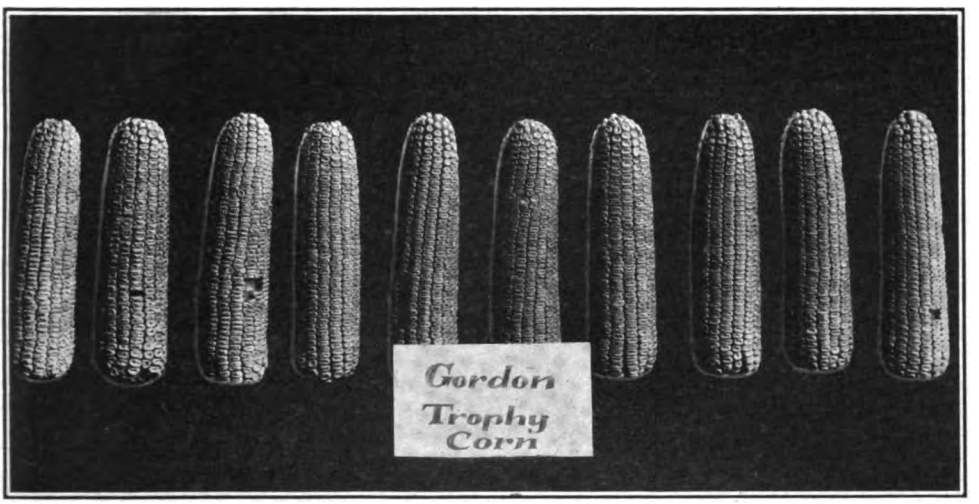
a little lighter than that of either the Japanese, the Silver Hull or the Common Grey varieties, but it is a dense grower and is highly prized for smothering weeds.

The potato crop in Ontario in 1912 amounted to $13,604,052, and for 1911, $11,722,539. The annual value of the potato crop in Ontario for the last ten years was about $9,000,000 and that for the last thirty-one years, $8,000,000. It will, therefore, be seen that the potato crop is an important one in Ontario. According to results of experiments which have been conducted there is a great variation in the yield per acre in the percentage of marketable potatoes, and in the susceptibility of the different varieties to rot. Some of the very best varieties according to the co-operative experiments are the Empire State and the Davies' Warrior of the late varieties, and the Extra Early Eureka, and the Irish Cobbler of the early varieties. If potato growers in Ontario would confine their attention more particularly to a few of the best varieties there would be less necessity of importing potatoes from outside the Province, and we would be able to get larger



Second best 10 ears of Corn in Show. Wisconsin No. 7; grown by Mr. Wilson, Charing Cross.

yields per acre, better quality of potatoes for home use, and a more uniform product for shipping to the larger markets.

The corn crop of Ontario amounts to $18,000,000 annually. According to the reports of the Bureau of Industries for Ontario, husking corn is decreasing slightly, and the corn for the silo is increasing considerably in Ontario. From experiments which we have conducted recently at Guelph we find that it is about as important to know the history of a certain strain of corn as it is to know the distinct variety, if reliable results are to be obtained. Some of the varieties have now been grown by farmers continuously for considerable periods of time, and each man has selected seed according to his own ideal, consequently, we have many different strains of the Leaming, of the White Cap Yellow Dent, of the Longfellow, and of numerous other varieties. The Wisconsin No. 7 being a more recent selection, is apparently more uniform at present, but according to reports received even that variety possesses minor strains of slight variations. As the corn crop is receiving particular attention at this Convention greater details will not be presented at this time.

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The alfalfa crop is one of the most interesting in Ontario. It is now greater than that used for potatoes. There have been many failures, but as the crop becomes more thoroughly understood the failures become less. For successful alfalfa growing it is important to have soil which is well underdrained either naturally or artificially. Good pure seed of a hardy variety of alfalfa should be used. The seed should be inoculated with the proper bacteria and should be sown on a good seed bed and in clean land. Care should be taken to sow at the right time and to not abuse the crop by pasturing or by too close cutting. If alfalfa is well established on land suitable for it, it should furnish crops annually for several years. The average yield of alfalfa at the Ontario Agricultural College for fifteen years has been three crops per acre per annum, which has amounted to fully twenty tons of green crop per acre, and nearly five tons of hay per acre per year. Where silos are in use an excellent plan is to make hay out of each of the first two crops of the season, and to use the third crop for mixing with the corn when filling the silo.

The use of a proper variety is probably more important in the case of alfalfa than with almost any other farm crop grown in the Province. We now have very conclusive experimental evidence that the Common alfalfa of the Western States is one of the most undesirable varieties for use in Ontario. As the Common seed of the Western States traces its history largely to California, Mexico and Central America and back to Spain, there has not been an opportunity for the tender plants to become killed, and when brought to Ontario it forms a very uncertain crop. Other strains which have been grown in the north for forty, fifty or sixty years are now proving decidedly more hardy. The Grimm and the Ontario Variegated have each produced excellent results in this Province, and we hope for a substantial and permanent development in alfalfa production by use of these more hardy strains. I have recently visited fields which have produced crops successfully and continuously for fifteen, eighteen, twenty and even twenty-three and twenty-four years since they were sown. Unfortunately, the supply of seed of these two hardy varieties of alfalfa is quite limited at the present time, but there is great room for profitable seed production of these hardy strains, and we believe that it would pay farmers handsomely to produce alfalfa seed providing they are located in sections of the country well suited to the growth of this crop. At the present time the rolling clay land between Brantford, Caledonia, Cayuga and eastward to Wellandport appears to be particularly suited to alfalfa seed production. It is quite likely that a considerable amount of seed will also be produced in other sections of Ontario, and it is quite probable that alfalfa as a hay crop will be successfully grown in practically all of the counties of the Province. It is very important, however, that the best methods of production be carefully studied and strictly followed if success is to be obtained.

Co-operative Experiments.

From what has been said in regard to the different varieties of farm crops it will be seen that it is of the greatest importance for the farmers to obtain the best varieties if they are to improve the crops of their farms. If they have not already conducted experiments to ascertain the best varieties, it is an easy matter to carry on some simple tests which will furnish information of inestimable value. The Ontario Agricultural and Experimental Union distributes free of charge each year seeds of leading varieties of farm crops for definite experimental

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work to about five thousand Ontario farmers. This work may be conducted by any farmers of Ontario who wish to receive the samples and conduct the experiments according to instructions which are furnished with the seed.

It is true that the samples which are sent out for the tests are comparatively small, but they are of the very best varieties, and nothing but pure seed of high quality is distributed. Progressive farmers soon obtain a large amount of seed from these comparatively small samples. As for instance, one farmer in York County in 1913 grew over 3,300 bushels of the O. A. C. No. 72 oats as the direct result of two pounds which were sown on his farm in the spring of 1911, that is, the two pounds increased to over 3,300 bushels in a third season. One farmer in Huron County obtained over 900 bushels of the O. A. C. No. 21 barley as the third crop from one pound which was sown in the experiment. At the Ontario Agricultural College we obtained over one hundred bushels of oats as a third crop from a single seed. It will, therefore, be seen that these small lots can be very rapidly increased to the great advantage of the growers.

It is through the co-operative experiments that a number of the leading varieties of farm crops of Ontario were introduced. After experiments have been made in the different localities attention should be given to the development of those which have given the highest returns in the different localities, with the object of using only a few of the very best kinds.

After securing the best varieties some of the farmers would find it of great assistance to become members of the Canadian Seed Growers' Association. This would enable them to carry on systematic selection at their own homes, and thus keep the varieties pure and of high quality so that the surplus seed could be sold at good prices and to the advantage, not only of themselves, but of farmers generally.

The yields per acre of the principal farm crops have been increasing in Ontario. If we divide the last thirty years into two periods of fifteen years each we find that for the latter as compared with the former period there has been an actual increase in yield of grain per acre of some of our principal farm crops about as follows: barley, 20 per cent.; wheat, 11 per cent.; oats, 10 per cent.; and corn, 7 per cent. We believe that with proper care these increases may be enlarged from year to year, but in order to bring this about the farmers of Ontario should give particular attention to the very best methods of crop improvement on their individual farms.

ADDRESS.

PROF. S. B. MCCREADY, ONTARIO AGRICULTURAL COLLEGE, GUELPH.

I have not seen a better argument in favor of the teaching of agriculture in the schools than you have shown yourselves at these lectures and at this corn fair. Here you are to-day, two hundred people, an average of 40 years of age, hungry for information about your jobs. You are engaged in asking questions of the people who address you. You are asking questions that might have been answered for you when you were twelve years of age, if agriculture had been taught in the schools in times gone past. You are asking questions that your child might have answered in his school work in continuation schools throughout the country instead of supporting these schools only to have them drain the young men of the rural districts for work in the cities and in the professions.

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Has agriculture a place in the public schools? If there is a place for corn show lectures, I think there should be a place for agriculture in the rural schools.

Throughout Ontario, however, we find that there is no demand for the teaching of agriculture in the schools on the part of the people of the rural sections. The people in the country do not seem to want it, queer as it may seem. In most places the farmers are opposed to them entirely. I was at a convention in Essex a short time ago at which there were some 125 trustees assembled, and in talking to one man about the question of having agriculture taught in the schools, he replied that they had come to the conclusion that they did not want it. One of the trustees, himself a farmer, said, "If anyone is to teach my boy plowing, I will do it at home." That is all he knew about the principle of teaching agriculture in the schools. He thought that the teacher would have to take the boys out and teach them how to plow.

Success in farming does not depend upon plowing, harvesting, harrowing or any other manual work, right as they are in their places. It depends upon thinking, intelligence, the ability to plan, and to manage the job, in liking the job, in being interested in the job, in being a close observer and in having enough interest to read about your affairs. There will always be hard work on a farm, but happiness and enjoyment, and success, not necessarily in reference to the bank account, is in liking the job, in being interested, in using the highest kind of intelligence in connection with the work on the farm.

We can teach that kind of agriculture in the schools. It is not based on plowing. We can only do it when we get the right kind of teachers, but if the demand for the teaching of agriculture is strong enough, the teachers will be forthcoming. It is one of the very best ways of solving the school problem of changing teachers, of poor attendance and the evil caused by the larger boys dropping out of school. Agriculturalized schools make for enthusiasm. The teachers will not leave if the trustees pay them more, and if the teachers are doing the work they will be worth the extra salary.

Ontario can have that kind of education if she wants it. It is up to the farmers and trustees to tell the Government that they do want it, and if they say they want it they should back up the teacher in getting it. The Government is so anxious to do it that they will take all the extra expense, as they consider the service of such a teacher a service to the country and the nation at large. It will keep the people in the country. If the teacher needs a little extra pay let him have it. It is worth nine hundred or a thousand dollars a year to have the work done right. The Government wants to do it, and the only stumbling block to the success of the scheme is the people themselves.

A VOICE: What if the Inspectors are opposed to it?

PROF. MCCREADY: Then take the Inspectors in hand.

A VOICE: Well then, please tell us how to do it.

PROF. MCCREADY: This is a democratic country. The Government should be made to serve the people by the people letting them know what they want. If anyone had been appointed by the Educational Department who is not meeting the needs of the people, or who is a stumbling block to progress, let the fact be known, and the matter will soon be rectified. The whole problem is in the hands of the people at large. Probably you need missionaries to go up and down the land preaching the benefit that can be secured through the teaching of agriculture in the schools. If these missionaries would do their work, then the people would soon let the Government know what they want, and the authorities would try to get it.

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Agriculture has been taught in public schools. It was part of the public school in 1847. There were three different text books in use at that time authorized and used. In 1898 the subject was compulsory, but there was no demand for it, and in a great many places there was opposition, so it was dropped. There are no text books now, but we are getting it, only in a different way. We are getting it through nature study. It was found that the schools were all too artificial, and some of the reformers set about to naturalize the school work. Now an effort is being made to make all of the experiences of a child in life assist in educating him. Nature study deals with the animal, plants, soil and weather, not as a subject such as grammar and arithmetic, but as a subject underlying all other subjects. What we should have is arithmetic on animals; composition, reading and literature on subjects that deal more with the actual life of the children out of school hours. We should have our rural schools agriculturalized. We know a new kind of rural school that will educate a child in terms of its daily life. Arithmetic could consist in questions of growing corn or raising a silo, or feeding hogs, composition on the best means for raising chickens. This would be instructive work and would educate the child by means of what they already know. I would not introduce agriculture in the schools, but rather introduce the schools into agriculture.

It is coming in that way. Let the boy at home have a plot to experiment on. Let him cut off the tassels on the corn, and put paper bags over the ears and over the leaves, and he will teach the whole neighborhood in a practical demonstration. Then it will not be necessary to come to the corn fairs and ask such questions. The questions you ask will be more advanced. Let him raise chickens. This is along the line of school gardening. If you see the possibilities of what I am saying, then lay aside a plot in the school.

I know a pupil in a school in this county who raised a crop of O. A. C. Oats No. 72, which brought him 110 bushels to the acre, when the best crop on the farms of the neighborhood was 50 bushels to the acre. Yet people find it hard to realize that there is a possibility in the school garden. That boy had enough seed to revolutionize the whole oat growing of the neighborhood. If we had in all of our 6,500 schools agriculture as one of the studies there would be no need of corn fairs like this, at least they would be of a much higher order, and much better in quality.

In this part of the country you ought to have a school for the older boys, say in Tilbury or Blenheim or some smaller place, where now you have continuation classes teaching Latin, Greek and other high subjects. Latin and Greek are all very well in their places, but the boys from the country homes want something different to make them the most useful citizens possible. Get about twenty of the schools to change their schemes of education and introduce manual training and domestic science and give the boys less German and French and Greek. Give them more agriculture.

The schools of this district, I must say, are leading in this work. They are doing more than any of the schools of the Province to branch out along this new and improved course of studies for the boys on the farm.

A VOICE: Are there not too many lady teachers in the rural schools for the good of the agricultural departments of the studies?

PROF. MCCREADY: Yes.

A VOICE: Then what are we to do?

PROF. MCCREADY: Get more money and you will get more men. I mean get more money from the section. It is not a square deal to the boys on the farms not to have a competent teacher instructing them in agriculture, and a man is the right kind of a teacher to do it. They require higher salaries. I earnestly look forward to the day when the men will stay in the profession of teaching.

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Some pictures were then shown on the screen depicting classes engaged in the detection of weed seeds, playing, studying at a wheat demonstration, racing, dancing, etc.

There is great need to teach pupils how to play and for that reason football, basket ball, and approved play grounds are the real thing in education. He also showed a number of Inspectors taking a short course in agriculture.

A VOICE: I hope it did them good.

ANOTHER: So do I.

PROF. MCCREADY: I will say this for the Inspectors of Ontario, that there is no country in the world where the schools have a better system of inspection than in Ontario, nor is there any place where the work is more effective.

Look at these slides and note that the girls are decorating back yards and growing vegetables in the city as a result of being encouraged to do so in the schools; ideal schools with school gardens; illustrations of poor schools show the comparison, etc. This slide is of the Rittenhouse School near St. Catharines which is supposed to be the finest school in the Province to-day. Some very interesting views are those of outdoor schools. We are going to have more outdoor schools in the future.

The views were concluded by showing fine schools in Australia, New Zealand, and other countries, and also a few views of Jack Miner's farm in Essex, where wild geese come from year to year, and where much information concerning bird life is obtained.

THE VALUE AND INTELLIGENCE OF OUR BIRDS ON THE FARM.

JACK MINER, KINGSVILLE.

I am a sort of converted Jesse James to the bird family, and I am going to tell you this afternoon what can be done with some of the wildest birds you ever saw. This is from personal observation and experience, and I am going to give you some pointers which I am sure will be of value to you.

This world is getting better every day, but we have made one great mistake. We have gone wrong with our birds. The Bible mentions the fowls of the air three times before it mentions man, and then in Gen. 1, 26. We are pestered with insects, and there is a new variety apparently coming out every year. A great mistake was made in killing off the birds which the Great Provider put here, and then we pay out hundreds of dollars in spraying our trees. Many varieties of birds have become extinct. I have time to take up only two of these varieties, and the first is the swallow family. They have an enemy, the English sparrow, which has exterminated them from the roofs of our barns. They cannot build up in the roofs of our barns as they used to. Some of you remember when there were thirty swallow nests among the rafters.

I protected one pair in my tile shed, three hundred feet from the machinery. We kept a rifle in there, but in spite of us the sparrows destroyed the first brood, which was five. The swallows raised one brood and the second year came back and there were two nests. They built half way up the shed because they began to see that we were not enemies. We built a chimney outside and put up sparrow coops to destroy the sparrows up there. There is a hole through the roof, and when a sparrow chirps that is about the last thing he does. I offer my boys a new hat when they can knock down the two that fly, one each way. They see father

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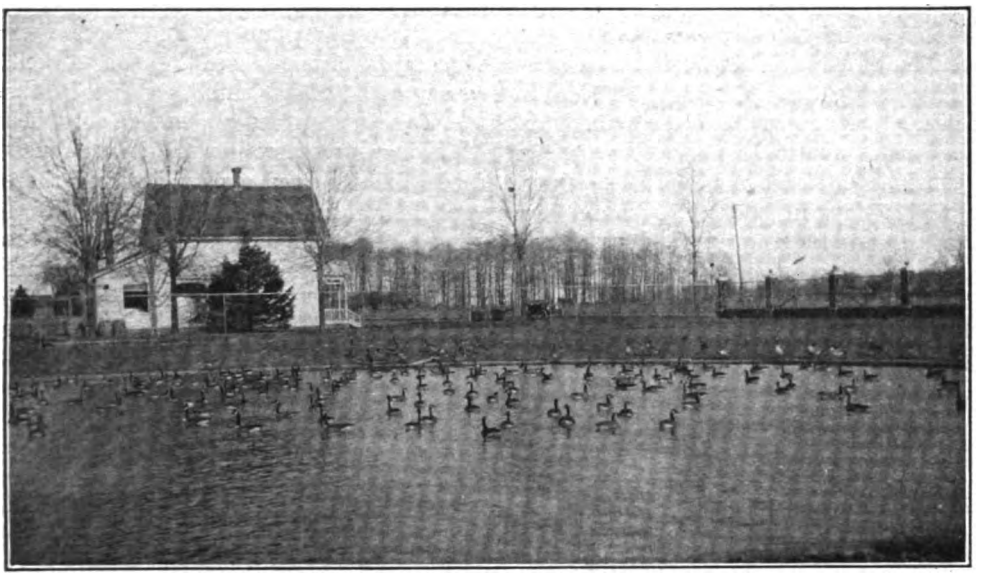

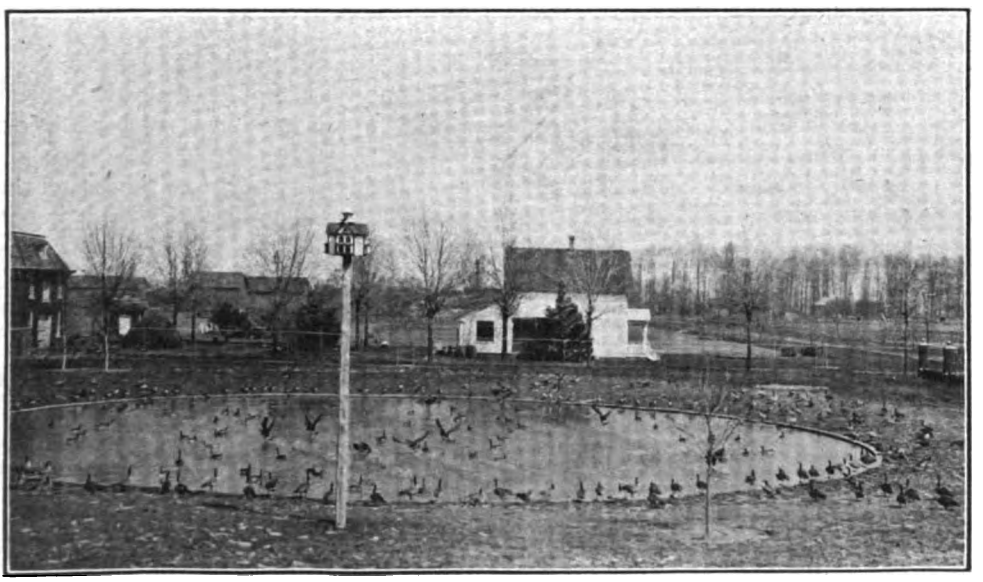

Canadian Wild Geese at the farm of Mr. Miner, near Kingsville, Ont.

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do it—once in a while. It is sport to shoot sparrows when you have the blue sky for a background as no one has a deed to that, and sometimes my trigger finger gets itching to shoot something.

In five years those swallows came down to our machinery, and there were fifteen nests but a few feet from where the steam was flying where the men worked. They are getting in neighbors' buildings around, but they cannot get up in the loft. They go in the horse stable where the English sparrow will not go in, when a door is apt to be shut. We have now fifteen nests of swallows, and each nest consumes at least one cupful of winged insects daily, fifteen cups a day and there are 115 days in summer. Where do they get their insects?

I sent to Pennsylvania for a martin house. We did not put it up until the wild geese went away on May 1. Thirteen of the twenty rooms were at once occupied. Just by giving these birds a little kindness there is not one fly on the premises where there were five. If the swallow destroys the fly, as we know he does, and if the fly carries typhoid as the scientists tell us, the swallow prolongs our lives. This compels us to believe Deut. 22, 6 and 7. I have seen three swallows on the back of a cart horse.

Robins come in the spring of the year to consume the cut worm crop. Scientists estimate that they consume the equivalent to fourteen feet of worms and grubs injurious to the farmers' crops. When the young robins are in the nest they consume their weight and two fifths over daily, of injurious grubs, etc. The robin saves much grain, and when it comes to your cherry tree, you slip out and bang him over because he took two cents worth of cherries.

Now to the woodpecker. My brother went out to where there was a woodpecker on the apple tree and shot him, and I cross questioned him. It was not my apple tree, but next spring I saw him with a big pruning knife at the tree getting out a little worm that was down in there. The woodpecker had been getting them out one by one and not making a hole as big as a gimlet hole. But brother with his knife did the tree far more harm than did the woodpecker and grubs combined.

Many years ago in the dark ages I knew a fellow with red hair that was so anxious to shoot that he moved a resolution for an open season on mourning doves. one of God's chief mourners. He never looks in the glass now without being ashamed if he thinks of it.

School children brought to my house a mourning dove that had flown against a telephone wire and killed itself. Now listen. Its crop was not half full, but it contained 43 grains of shrunk wheat which it had collected from a stubble field and 1,790 weed seeds. When men tell you a dove eats 10,000 weed seeds a day, you can believe it just as much as you can believe you are alive. And we are allowing Jack Miner to shoot them, while we pay another fellow two dollars and fifteen cents a day to hoe weeds out of our corn.

One of the most cheerful birds we have had on the farm is the quail. I am not driving at any man because he likes to shoot quail. I have left a bloody train behind me. My brother and I used to wheel them in a barrow once or twice a week up to the old stage line and sell them. We have shot them when their crops were full of weed seeds. That was our business. Hardly a quail is left. How are we to have more quail? People say the old rail fences are gone and we cannot help them, but what is the old rail fence when winter comes, and snow is drifting across the field? It is a snow bank and a death trap for every quail under it. We sit around some store and turn over the old soap box because it is tired on that end, and talk about quail. I have lived among the quail, and I put up ten little

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bungalows six feet square, leaving the south side open. They were about a foot high in the rear. In the fall we threw an armful of leaves in there. I begged ten bushels of weed seeds from a neighbor who was hulling clover and threw a bushel into each house. Also a half bushel of buckwheat and other grain. The quail when winter came on found the houses. I threw grain outside so that they would be sure to go in. What did they eat? The corn and wheat? No, they scratched right down into the weed seeds and ate them first. But the English pheasant, the fellow I imported and liberated in there, lives entirely on grain if he can get it. The quail will not eat grain when he can get weed seeds. He is a weed seed destroyer.

This fall there were only eleven quail, and I wondered where they had gone. But when the zero weather came I saw over a hundred in the houses, and there were more eating from the bungalows that week than ever before. I went down the other day and the quail had gone out, and they were living on their own choice of food, weed seeds. I have raised quail in captivity and they will not live on grain.

The hawk is the enemy of the quail. Man, you see, has combined his forces with the quail's natural enemy. The great provider evidently put those hawks and owls on earth to eat up the weaker ones such as would introduce disease. After giving it a lifetime of study there is no doubt of that in my mind at all. Men will stand up and tell you we must not shoot the owl. The worst enemy the quail birds have is the great cat owl, or hoot owl or horned owl as it is called. He is strong and will come every night. We had to drop him before we could have a bird.

The great cry is about mice. There were mice in the orchard when I was so high, and there will always be. And you will always have trees killed as long as you depend on the owls to get the mice, because the owls will not go past the birds.

A friend of mine saw an advertisement on how to exterminate potato bugs and of course he sent a dollar for the receipt. In reply he received a little block and mallet. It said "Put him on No. 1 and hit him with No. 2." Fruit grower, listen: Near the old schoolhouse in Ohio was a farmer who had left his clover straw unthreshed in the field, and some of us fellows turned over the little pile and got our pockets full of field mice. The trustees never solved the problem of where the mice came from in that school house, and never will, because the supply ran out. Take that old clover stack that has not yet been moved, or some old lumber, and put them in your orchard, lay boards two or three side by side, or throw clover straw a bushel or two in a place for cover, and call a few school boys in a few days later, use a six tined fork around the pile, to cut off the runways and you can kill them. Dead mice hurt no trees.

I have been labelling wild ducks, and the labels have come back to me from different southern states. If I do not hear from the birds in this way, the birds come back. If these things were something I read about, I do not know that I would read the whole of it myself; but such are the positive facts. In 1904 we had seven wild geese on our farm. They were first enclosed and wings clipped, but after being liberated were quite tame. It was not until 1908 that they were joined by eleven wild ones. The whole neighborhood was interested. These geese became quite tame; but we shot five of them, the other six went away to the lake. When they came back I saw one of the neighbors who said, "I would not ask to shoot at these again." But owing to the leader of the remaining six being wounded, they stayed until May 15th.

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Men would come on special trips to tell you how their gradmother's Uncle Dave killed geese in their day. I had hunted geese for twenty-five years. Up to March 19th, 1909, I had it rubbed in quite a bit about the failure of the geese to come back, but on that day there was a great honking, and such a meeting and dancing and tip-toeing, and bowing and saluting. That spring altogether there were 32. We shot ten. The other 22 went north and the next spring 350 came back. We have not been able to count them since.

Every Canadian should be proud that the wild goose is called Canadian goose. He is superior to any goose I know. For intelligence, I want to tell you, there are a lot of things we can learn from him. I put up a net this fall, and in less than two weeks had them coming in. The old gander would walk right up and take a few kernels from each ear of corn, would walk right out and two or three young ones would go in at a time. When the old gander goes in, it takes five or six to watch. When he watches that is all that is required. When you go to shoot wild geese and see one watching, do not shoot him because you will get the old one.

One spring a pair decided to go to keeping house. They built a nest about 200 ft. north of the tile shed, and as it was near the path used by horses and cow, I experienced all kinds of borrowed trouble, fearing old Charlie, the cart horse, would put a clumsey foot in it. One day as I stood in the doorway, I saw him gazing closer and closer until Mrs. Goose finally rose up with extended wing, and as Charlie threw his ears forward at the strange looking creature, old Jack Johnson, the big gander, grabbed him by the fetlock and both geese honked and screamed, and really I never saw a horse more frightened before nor since. He threw his tail up and snorted, and ran because he could not fly. When he got about a hundred yards away he stopped for a second and looked back, gave another snort and started again, and to this day he gives that particular spot a wide berth. After sitting nearly the required time old Mrs. Goose took sick and was compelled to leave the nest, so we fought Jack Johnson away, and took the six eggs and put them under an old Plymouth Rock hen. In a few days all six hatched, and really we never had nicer pets than those six goslings were. But all the time Jack Johnson kept honking and searching the pasture field for those eggs. Well, they soon were larger than their stepmother, and I have seen the whole six trying to huddle under her, she with drooped wings looked as if they were using her for an umbrella. Then there was more trouble. The lady of the house rebelled, and gave us to understand that our back doorstep was not made for geese to roost on, etc. So one morning I coaxed them into the pasture field. Now, remember, they had been raised entirely by themselves. There is a six foot brick wall between them and their original parents; but as soon as Jack Johnson saw them he came, and I ran right out fearing that he was going to kill them all. But as he got close each gosling lay flat on the ground, and he caressed each separately; then he honked and flapped his wings, and went back, and met his old sweetheart, who had partly recovered, and really when she got there, I witnessed the sweetest reunion of my life, and I would not say that my eyes were perfectly dry as I witnessed that loving sight. As all started away together, Jack Johnson looked around and saw the old hen, and he turned and gave her one that knocked squawks and feathers out of her all the way to the hen house. But in about a half hour the eight geese returned, the goslings leading the way. They wanted their stepmother, so with a handful of feed I earnestly coaxed her down off the fence, and instead of Jack Johnson fighting her he protected her. From that time on she lived with these eight geese out at the pond until snow drove her to the building.

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As we advance in years and earth's ties grow less our thoughts are riveted more and more on the Beautiful Beyond and the great reunion that awaits each of us. But will we know our loved ones when we meet there? Will dear mother's hands be cramped with rheumatism, and her face wrinkled with age. Will father's shoulders be bent through the trials and cares of earth's long battle, or will they look as they did when they first became sweethearts? If the latter, how will we know them?

If our darling little girl has lost her childish curls and has become a woman, or if our promising boy has become a man, surely, surely we will yet know them. If God in heaven can give a wild goose power and intelligence enough to know their loved ones whom they have never seen, then that clears all doubt as to whether I will know mine; and this thought alone had doubly paid me for the one thousand bushels of corn I have fed these wild geese during the last three years.

ELECTRICITY FOR THE FARM.

J. W. PURCELL, HYDRO-ELECTRIC ENGINEER, TORONTO.

Electricity on the farm can now be a realized hope in Western Ontario. The new main transmission line recently constructed from St. Thomas to Windsor, on a diagonal to Ridgetown, then on a diagonal line through Chatham to the Essex Station, south of Walkerville, with its branch lines will put this labor saver at the service of every community.

It has been hard to get the farmer to concede that his own part of the work is worth anything when you come to reduce his work to dollars and cents a day. But I think that within the last few years the difficulty in obtaining labor on the farm has brought him to see that if he does not do the work himself, the man he must hire to do the work is a considerable source of expense and therefore his own time must be worth something.

We invite all of you to examine our exhibit in the Armouries. There we have a few demonstrations of what may be done on the farm and is within the reach of the most moderate pocket, and in fact in many cases would prove a very profitable investment and not a mere luxury.

There you will see a thirty gallon water heater kept at boiling point all night by the expenditure of 7/8 of one horse-power of electricity. Examine for yourself the electric cooker which can be turned on whenever required and will cook food in the most sanitary method possible with the waste of a smaller quantity of heat through the atmosphere than by any other method.

The Hydro Commission is not out to make profits. "Service at Cost" is one of our mottoes. The Commission is a Government concern and its aim is to supply the people with power at cost. When the profits increase the rates will decrease.

In Oxford and Elgin the hydro have demonstration farms where all work which can profitably be done by electricity is done. Silos are filled at one-half the ordinary cost. Milking machines, water pumps, vacuum cleaners, washing machines and saw mills are all worked to advantage by the labor saver. While perhaps one of the most striking examples of the usefulness of electricity is the operation of grain separators, on the demonstration farms oats have been threshed at the rate of 125 bushels an hour for 25 minutes, and at a 100 bushels rate for one hour without operating the blower.

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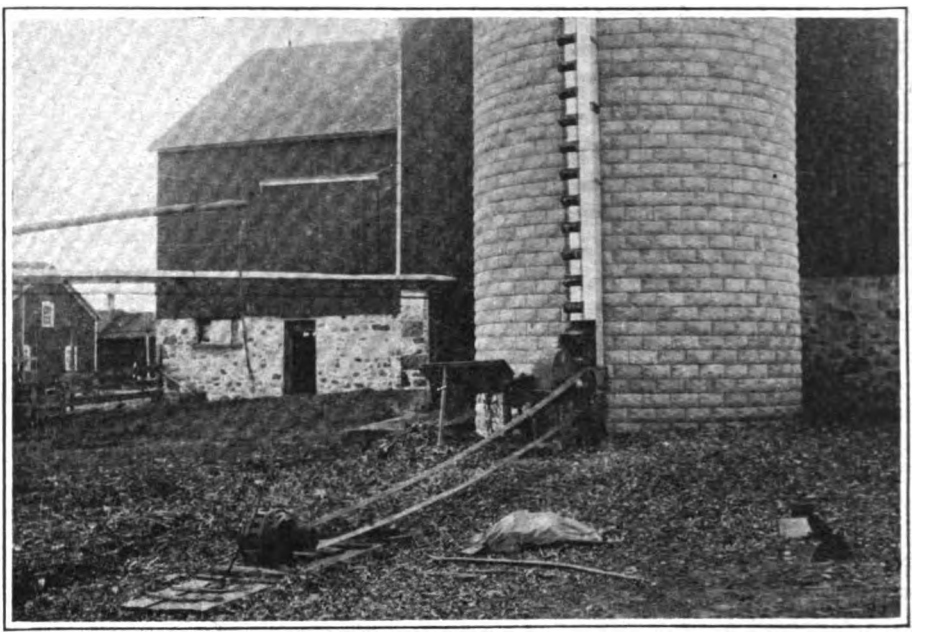
You farmers of Essex and Kent will soon be wanting to know exactly how to go about obtaining a power supply. In this line of work, as in many others, co-operation is the keynote of success. Not only is the price regulated by the number of individuals in your own community wishing to have power; the number of municipalities taking the power in the district will probably be the chief governing factor. The cost to the nearest municipality plus the cost of stepping it down to the voltage at which it is going to be distributed and of delivery to the point where you take it varies considerably from township to township.

Keep this in mind: As many of you as possible must act at once. A number of ratepayers petition the Township Council for an estimate of the cost of power for them. The township council then passes on this request, which includes a certain amount of information, such as the lot number, concession, amounts of



Filling the Silo by Electric Power.

light they are likely to need, and the amount of horse-power they want to use. A map on which all the places to be served are marked should also be sent. The council then send on the petition to the Commission, and the Commission instructs the engineering department to work up an estimate of costs to serve those particular ratepayers. As soon as that estimate is worked up and approved of by the chief engineer and the Commission, it is submitted back to the council, which according to the Act must call a meeting of the ratepayers who have signed the petition and submit the estimate to them. They at the meeting may signify whether they shall proceed or not.

The rate to the townships will be upon the same basis as that to any municipality—that is, the peak for twenty consecutive minutes. The township sells to the consumer on the basis of service, which depends entirely on the basis of number per mile in the township, and revenue must cover the capital investment of the township. If we have a number of contracts signed the Commission places poles to the farmer's gate and also a step-down transformer. It also provides secondary

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wires to the first pole on the premises. From that point the farmer has to install the plant with the exception of a meter, if needed. The farmer wires it to his house, barn, milkhouse or any other buildings he wishes.

The service charges on average conditions work out that three customers in a mile pay $3 a month, four in a mile pay $2.50 a month, five in a mile pay $2 a month, and less as the number increases, which shows the advantage of getting as many as possible to act at once.

STANDARDIZING VARIETIES.

It has been felt for some time by members of the O.C.G.A. and others that it was becoming more and more necessary to standardize the varieties of corn suitable for Ontario. The Executive appointed a committee to draw up standards for the varieties recommended as suitable to be grown in Ontario. The Committee appointed were: Prof. Klinck, Quebec; L. H. Newman, Ottawa; A. McKenney, Amherstburg; T. S. Biggar, Walkerville: L. D. Hankinson, Aylmer; J. H. Williams, Fletcher; W. E. J. Edwards, Essex.

After obtaining the opinion of many of the most successful growers of the recommended varieties, the committee arrived at the following standards. The recommended varieties may be added to as is seen necessary, but at present it is felt that the seven varieties standardized fill the requirements for Ontario:

STANDARDS OUTLINED FOR RECOMMENDED.

DENTS.

(1) *Wisconsin No. 7.*

Ear	Length	8½"—9½"
	Circumference	7"—7½"
Kernel	Color	Creamy White.
	Indentation	Well Dented.
	Rows	16—18.
Butt	Moderately Rounded.	
Tip	Well Covered. Fairly Full.	
Cob	Color	Glistening White.

(2) *Bailey.*

Ear	Length	7¾"—8½"
	Circumference	6¾"—7¼"
Kernel	Color	Yellow Cap with reddish tinge lower.
	Indentation	Nicely Dented.
	Rows	16—18.
Butt	Moderately Rounded.	
Tip	Full. Well covered.	
Cob	Color	Dark Red.

(3) *White Cap Yellow Dent.*

Ear	Length	7¾"—8½"
	Circumference	6⅝"—6⅞"
Kernel	Color	Cap White, remainder yellow.
	Indentation	Fairly Rough.
	Rows	14—16.
Butt	Moderately Rounded.	
Tip	Well Covered, slightly tapering.	
Cob	Color	Red or White.

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(4) *Golden Glow.*

Ear	Length	8¼"—9¼"
	Circumference	6½"—7"
Kernel	Color	Deep Yellow.
	Indentation	Medium.
	Rows	14—16.
Butt		Moderately Rounded.
Tip		Slightly tapering.
Cob	Color	Cherry Red.

FLINTS.

(1) *Longfellow.*

Ear	Length	10½"—11½"
	Circumference	4½"—5".
Kernel	Color	Deep Golden Yellow.
	Indentation	None.
	Rows	Eight.
Butt		No larger than one-third distance up ear.
Tip		Slightly tapering and well covered.
Cob	Color	Pure White.

(2) *Salzer's North Dakota.*

Ear	Length	11"—12"
	Circumference	5"—5½"
Kernel	Color	Pearly White.
	Indentation	None.
	Rows	Eight.
Butt		No larger than one-third distance up ear.
Tip		Slightly tapering and well covered.
Cob	Color	Pure White.

(3) *Compton's Early.*

Ear	Length	12"—13"
	Circumference	5½"—6"
Kernel	Color	Deep Golden Yellow.
	Indentation	None.
	Rows	Twelve.
Butt		No larger than one-third distance up ear.
Tip		Well covered.
Cob	Color	Pure White.

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Forty-Fourth Annual Report

OF THE

Entomological Society

OF ONTARIO

1913

(PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE, TORONTO)

PRINTED BY ORDER OF

THE LEGISLATIVE ASSEMBLY OF ONTARIO

TORONTO:

Printed by L. K. CAMERON, Printer to the King's Most Excellent Majesty

1914

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Printed By
WILLIAM BRIGGS
29-37 Richmond St. W
TORONTO

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To His Honour Col. Sir John Morison Gibson, K.C.M.G., etc., etc., etc.,
Lieutenant-Governor of the Province of Ontario.

May it Please Your Honour:

The undersigned begs to present herewith, for the consideration of your Honour, the Report of the Entomological Society of Ontario for 1913.

Respectfully submitted,

JAMES S. DUFF,

Minister of Agriculture.

Toronto, 1914.

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ENTOMOLOGICAL SOCIETY OF ONTARIO—FIFTIETH ANNUAL MEETING.

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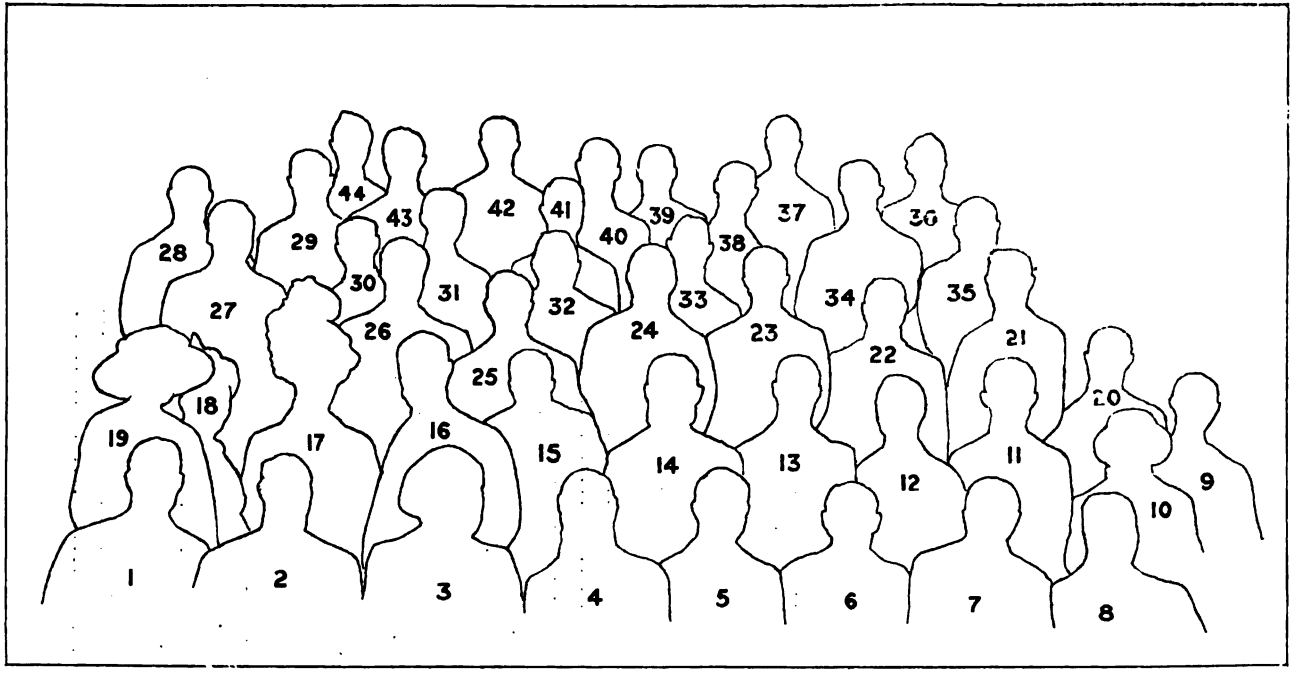

1. Prof. W. M. Wheeler. 2. Rev. T. W. Fyles. 3. Mrs. Comstock. 4. Rev. Prof. C. J. S. Bethune. 5. Dr. C. G. Hewitt. 6. Prof. J. H Comstock. 7. Prof. F. M. Webster. 8. Dr. G. C. Creelman. 9. Prof. T. D. Jarvis. 10. Mrs. Jarvis. 11. Dr. E. P. Felt. 12. Prof. P. J. Parrott. 13. J. F. Brimley. 14. J. D. Evans. 15. G. Meade-Waldo. 16. H. H. Lyman. 17. Mrs. Lyman. 18. Miss Bethune. 19. Mrs. C. G. Hewitt. 20. A. Gibson. 21. F. W. L. Sladen. 22. Dr. R. S. MacDougall. 23. Prof. E. M. Walker. 24. Prof. W. Lochhead. 25. Prof. J. Dearness. 26. W. E. Saunders. 27. Dr. A. Cosens. 28. J. J. DeVyver. 29. H. Curran. 30. L. Caesar. 31. R. S. Hamilton. 32. J. C. Chapais. 33. C. E. Petch. 34. R. C. Treherne. 35. Prof. T. J. Headlee. 36. W. A. Ross. 37. A. W. Baker. 38. J. D. Tothill. 39. L. S. McLaine. 40. G. J. Spencer. 41. W. A. Clemens. 42. J. F. Hudson. 43. A. Burrows. 44. G. E. Sanders.

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FORTY-FOURTH ANNUAL REPORT

OF THE

Entomological Society of Ontario

1913

To the Honourable James S. Duff, Minister of Agriculture.

SIR,—I have the honour to present herewith the Forty-fourth Annual Report of the Entomological Society of Ontario.

The fiftieth Annual Meeting of the Society was held at Guelph on the 27th, 28th, and 29th of August, 1913, and was one of the most important occasions in the Society's history. It was attended not only by a large number of the Society's members, but also by many distinguished entomologists representing other societies and institutions in the United States and Great Britain.

The addresses and papers presented, together with the reports of the various officers and branches of the Society are embodied in the following pages.

The *Canadian Entomologist*, the Society's monthly organ, has now completed its forty-fifth volume, and continues to maintain its wide circulation and high scientific value.

I have the honour to be, Sir,

Your obedient servant,

EDMUND M. WALKER,

Editor.

Department of Biology,

University of Toronto.

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Entomological Society of Ontario

OFFICERS FOR 1913-1914

President—C. Gordon Hewitt, D.Sc., F.R.S.C., Dominion Entomologist, Central Experimental Farm, Ottawa.

Vice-President—Mr. A. F. Winn, Westmount, Quebec.

Secretary-Treasurer—Mr. A. W. Baker, B.S.A., Demonstrator in Entomology, O. A. College, Guelph.

Curator—Mr. G. J. Spencer, Assistant in Entomology, O. A. College, Guelph.

Librarian—Rev. C. J. S. Bethune, M.A., D.C.L., F.R.S.C., Professor of Entomology and Zoology, O. A. College, Guelph.

Directors—Division No. 1, Mr. Arthur Gibson, Division of Entomology, Central Experimental Farm, Ottawa; Division No. 2, Mr. C. E. Grant, Orillia; Division No. 3, Mr. A. Cosens, Parkdale Collegiate Institute, Toronto; Division No. 4, Mr. C. W. Nash, East Toronto; Division No. 5, Mr. F. J. A. Morris, Peterborough; Division No. 6. Mr. R. S. Hamilton, Collegiate Institute, Galt; Division No. 7, Mr. W. A. Ross, Jordan Harbour.

Directors (Ex-Presidents of the Society)—Professor Wm. Saunders, C.M.G., LL.D., F.R.S.C., F.L.S., late Director of the Experimental Farms of the Dominion of Canada, Ottawa; Rev. C. J. S. Bethune, M.A., D.C.L., F.R.S.C., Guelph; W. Hague Harrington, F.R.S.C., Ottawa; Professor John Dearness, Vice-Principal Normal School, London; Henry H. Lyman, M.A., F.E.S., F.R.G.S., Montreal; Rev. Thomas W. Fyles, D.C.L., F.L.S., Ottawa; Professor Wm. Lochhead, B.A., M.S., Macdonald College, Que.; John D. Evans, C.E., Chief Engineer, Central Ontario Railway, Trenton; Professor Tennyson D. Jarvis, B.S.A., Ontario Agricultural College, Guelph; Professor E. M. Walker, B.A., M.B., University of Toronto.

Editor of "The Canadian Entomologist"—Prof. E. M. Walker, Toronto.

Delegate to the Royal Society—Mr. H. H. Lyman, Montreal.

Auditors—Professor J. E. Howitt, M.S.A., and Mr. L. Caesar, B.A., M.S.A., O. A. College, Guelph.

FINANCIAL STATEMENT

For the year ending October, 1913

Receipts.		*Expenditures.*	
Balance from 1911-12	$698 88	Cork and pins	$81 03
Members' fees	387 20	Printing	1,014 56
Advertisements	40 71	Expense	48 17
Government grant	1,000 00	Salaries	250 00
Sale reports and back numbers.	208 74	Library	38 22
Sale cork and pins	63 10	Annual meeting	98 55
Jubilee meeting	28 36	Annual report	125 95
Bank interest	30 43	Jubilee meeting	197 90
		Bank exchange	3 95
		Balance on hand	599 09
	$2,457 42		$2,457 42

Auditors { J. E. Howitt, L. Caesar.

Respectfully submitted,
A. W. Baker,
Secy.-Treas.

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PRESIDENTS ENTOMOLOGICAL SOCIETY OF ONTARIO

1863-4.....Professor Croft.
1864-5.....Wm. Saunders.
1865-8.....Rev. W. Hincks.
1868-71.....Professor Croft.
1871-6.....Rev. C. J. S. Bethune.
1876-87.....Wm. Saunders.
1887-90.....Jas. Fletcher.
1890-3.....Rev. C. J. S. Bethune.
1893-6.....W. Hague Harrington.
1896-8.....J. Dearness.
1898-1900....H. H. Lyman.
1900-3.....Rev. T. W. Fyles.
1903-5.....Prof. Wm. Lochhead.
1905-7.....J. D. Evans.
1907-9.....Dr. Jas. Fletcher.
1909-10.....T. D. Jarvis.
1910-2.....Dr. E. M. Walker.
1912-3.....Rev. Prof. C. J. S. Bethune.

VICE-PRESIDENTS ENTOMOLOGICAL SOCIETY OF ONTARIO

1864-5.....Rev. W. Hincks.
1865-8.....Wm. Saunders.
1868-9.....Johnson Pettit and Wm. Saunders.
1869-71.....E. Baynes Reed and B. Billings.
1871-4.....Wm. Saunders.
1874-5.....E. Baynes Reed.
1875-6.....R. V. Rogers.
1876-8.....Rev. C. J. S. Bethune.
1878-9.....E. Baynes Reed.
1879-80.....Rev. C. J. S. Bethune.
1880-1.....Jas. Fletcher.
1881-2.....Rev. C. J. S. Bethune.
1882-4.....G. J. Bowles.
1884-6.....Jas. Fletcher.
1886-8.....Rev. C. J. S. Bethune.
1888-91.....E. Baynes Reed.
1891-2.....Jas. Fletcher.
1892-3.....W. Hague Harrington.
1893-4.....J. M. Denton.
1894-6.....J. Dearness.
1896-8.....H. H. Lyman.
1898-9.....Prof. J. H. Panton.
1899-1900....Rev. T. W. Fyles.
1900-3.....Prof. Wm. Lochhead.
1903-5.....J. D. Evans.
1905-7.....Dr. Jas. Fletcher.
1907-9.....Tennyson D. Jarvis.
1909-10.....Dr. E. M. Walker.
1910-3.....Dr. C. Gordon Hewitt.

SECRETARY-TREASURERS ENTOMOLOGICAL SOCIETY OF ONTARIO

1863-4.....Wm. Saunders.
1864-71.....Rev. C. J. S. Bethune.
1871-4.....E. Baynes Reed.
1874-5.....Jas. Williams.
1875-8.....J. H. McMechan.
1878-9.....Jas. Williams.
1879-81.....Jas. H. Bowman.
1881-3.....E. Baynes Reed.
1888-91.....W. E. Saunders.
1891-3.....W. E. Saunders and J. M. Denton.
1893-1901....W. E. Saunders and J. A. Balkwell.
1901-4.....W. E. Saunders and J. H. Bowman.
1904-6.....W. E. Saunders and J. A. Balkwell.
1906-8.....L. Caesar and Prof. S. B. McCready.
1908-11.....J. E. Howitt.
1911-3.....A. W. Baker.

CURATORS

1863-5.....Jas. Hubbert.
1865-8.....Robert V. Rogers.
1868-9.....W. H. Ellis.
1869-72.....W. Osler.
1888-9.....Henry S. Saunders.
1889-1905....J. A. Moffat.
1905-7.....Rev. C. J. S. Bethune.
1907-9.....J. E. Howitt.
1909-12.....L. Caesar.
1912-3.....G. J. Spencer.

HONORARY MEMBERS ENTOMOLOGICAL SOCIETY OF ONTARIO

Honorary Members.	*Elected.*	*Died.*
1. Francis Walker, F.L.S., Assistant in the Entomological Department of the British Museum, Elm Hall, Wanstead, Essex, England.	Feb. 16, 1865.	Oct. 5, 1874. aged 65.
2. Ezra T. Cresson, Hymenopterist, one of the founders of the American Entomological Society, Philadelphia.	Nov. 10, 1868.	
3. William H. Edwards, Coalburgh, Kanawha Co., West Va., author of "The Butterflies of North America," and of a long series of papers in the "Canadian Entomologist."	Nov. 10, 1868.	Apl. 2, 1909, aged 87.

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Honorary Members.	*Elected.*	*Died.*
4. Prof. Townend Glover, Entomologist to the Department of Agriculture, Washington, D.C.	Nov. 10, 1868.	Sept. 8, 1883, aged 70.
5. Augustus Radcliffe Grote, M.A., Buffalo, N.Y., Lepidopterist. Described a large number of new species and contributed for many years to the "Canadian Entomologist."	Nov. 10, 1868.	Sept. 12, 1903,
6. Dr. George H. Horn, Philadelphia, Pa., Coleopterist. Joint author with Dr. J. L. LeConte, of the "Classification of North American Coleoptera," and other works.	Nov. 10, 1868.	Nov. 24, 1897, aged 57.
7. Dr. A. S. Packard, Jr., Peabody Academy, Salem, Mass. Author of numerous works on systematic, technical and popular Entomology.	Nov. 10, 1868.	Feb. 14, 1905 aged 66.
8. Dr. C. V. Riley, Missouri; State Entomologist, chief of the United States Bureau of Entomology, Washington, D.C.	Nov. 10, 1868.	Sept. 14, 1895, aged 52.
9. Dr. S. H. Scudder, Boston, Mass. Author of "The Butterflies of Eastern United States and Canada," and of various works on Orthoptera, Fossil Insects, etc.	Nov. 10, 1868.	May 17, 1911, aged 74.
10. Dr. J. L. LeConte, Philadelphia, Coleopterist. Author of a large number of books and papers on systematic Coleopterology, and the describer of an immense number of species.	Nov. 10, 1868.	Nov. 15, 1883, aged 58.
11. Baron R. Von Osten Sacken, Russian Embassy, New York, Dipterist. Author of some of the earliest works on North American Diptera, published by the Smithsonian Institution.	Sept. 22, 1869.	May 20, 1906, aged 76.
12. Dr. Herman Hagen, Cambridge, Mass., Neuropterist, Director of the Museum of Comparative Zoology.	Sept. 22, 1869.	Nov. 9, 1893, aged 77.
13. Dr. Asa Fitch, the first State Entomologist of New York. Albany, N.Y.	Sept. 22, 1869.	Apl. 8, 1879, aged 70.
14. P. R. Uhler, Baltimore, Md., Hemipterist. For many years the chief authority on North American Hemiptera.	Sept. 25, 1873.	Oct. 21, 1913, aged 78.
15. V. T. Chambers, Covington, Ky.. Lepidopterist. An early contributor to "The Canadian Entomologist."	Sept. 25, 1873.	Aug. 7, 1883, aged 52.
16. Miss Eleanor A. Ormerod, LL.D., St. Albans, England. Pioneer worker in Economic Entomology in Great Britain, and authoress of a series of annual reports issued during more than twenty years.	Sept. 25, 1873.	July 19, 1901, aged 73.
17. Dr. L. O. Howard, Chief of the Bureau of Entomology. Washington, D.C.	Oct. 12, 1899.	
18. Prof. John B. Smith, Sc.D., State Entomologist of New Jersey, and Professor of Entomology in Rutgers' College, New Brunswick, N.J.	Oct. 12, 1899.	Mch. 12, 1912. aged 54.
19. Prof. F. M. Webster, Wooster, Ohio. In charge of investigations regarding insects attacking cereal crops, Bureau of Entomology, Washington. D.C.	Oct. 12, 1899.	
20. Prof. H. F. Wickham, M.A., Coleopterist, Professor of Entomology, Iowa State University, Iowa City, Iowa.	Oct. 12, 1899.	
21. Dr. Wm. A. Ashmead, Hymenopterist. Author of many papers on the order. U.S. National Museum, Washington, D.C.	Oct. 27, 1904.	Oct. 17, 1908, aged 53.

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Honorary Members.	*Elected.*	*Died.*
22. Prof. T. D. A. Cockerell, Hymenopterist. Author of numerous papers on Coccidae. Apidæ, and Fossil Insects. University of Colorado, Boulder, Colorado.	Oct. 18, 1905.	
23. Prof. J. H. Comstock, Author of the "Manual for the Study of Insects." "The Spider Book," etc., Cornell Univirsity, Ithaca. N.Y.	Nov. 23, 1911.	
24. Dr. E. P. Felt, State Entomologist of New York, Albany, N.Y.	Nov. 23, 1911.	

LIFE MEMBERS

1. Dr. William Saunders, C.M.G., LL.D., F.R.S.C., Director of the Experimental Farms of the Dominion.—October 20, 1886.

2. Rev. C. J. S. Bethune, M.A., D.C.L., F.R.S.C., Professor of Entomology, Ontario Agricultural College, Guelph.—November 3, 1910.

3. Edmund Baynes Reed, Director of the Meteorological Station, Victoria, B.C.—November 23, 1911.

4. Rev. Thomas W. Fyles, D.C.L., former President of the Society and of the Quebec Branch, Ottawa.—August 28, 1913.

LIST OF MEMBERS

Ontario.

Astwood, J. C. ..... Port Arthur.
Auden, K. F. ..... Toronto.
Baker, A. W. ..... Guelph.
Beaulieu, Germain ..... Ottawa.
Beck, H. P. ..... London.
Bethune, Prof. ..... Guelph.
Bicknell, H. E. ..... Toronto.
Brimley, J. F. ..... Grimsby.
Bock, H. P. ..... London.
Burrows, A. R. ..... Guelph.
Caesar, L. ..... "
Calvert, E. N. ..... "
Calvert, J. F. ..... London.
Clemens, W. A. ..... Toronto.
Craigie, E. H. ..... "
Cosens, A. ..... "
Curran, H. ..... Guelph.
Dearness, J. ..... London.
Doherty, T. K. ..... Ottawa.
Duff, G. H. ..... Toronto.
Duncan, R. S. ..... Port Hope.
Dunlop, James ..... Woodstock.
Evans, J. D. ..... Trenton.
Fyles, Rev. Dr. ..... Ottawa.
Germain, Bro. ..... "
Gibson, Arthur ..... "
Good, C. A. ..... Guelph.
Grant, C. E. ..... Orillia.
Hahn, Paul ..... Toronto.
Haight, D. H. ..... Sudbury.
Harkness, D. ..... Jordan Harbor.
Harrington, W. H. ..... Ottawa.
Hewitt, Dr. C. G. ..... "
Howitt, Prof. J. E. ..... Guelph.
Hudson, H. F. ..... Ottawa.
Inglis, John ..... Hamilton.
Jackson, V. ..... Toronto.
Kilman, A. H. ..... Ridgeway.
Kitto, V. ..... Ottawa.
Logier, W. ..... Toronto.
Morden, A. ..... London.
Morris, F. J. A. ..... Peterboro.
McCready, S. B. ..... Guelph.
McKechnie. J. B. ..... Toronto.
Nash, C. W. ..... "
Noble, J. W. ..... London.
Patterson, A. M. ..... Toronto.
Petch, C. E. ..... Ottawa.
Prewett, F. J. ..... Toronto.
Ross, W. A. ..... Jordan Harbor.
Sanders, G. E. ..... Ottawa.
Saunders, Dr. Wm. ..... London.
Saxby, W. ..... Toronto.
Sladen, F. W. L. ..... Ottawa.
Smith, A. ..... Toronto.
Snazelle, Charles ..... "
Spencer, G. ..... Guelph.
Strickland, E. H. ..... Ottawa.
Tanner, Harold ..... Stratford.
Thompson, W. R. ..... London.
Tomlinson, Robert ..... Toronto.
Tothill, J. D. ..... Ottawa.
Walker, Dr. E. M. ..... Toronto.
Ware, Thomas ..... Paris Station.
Washington, L. P. ..... Hamilton.
Watson, Dr. A. H. R. .... Port Hope.
White, James ..... Snelgrove.
Williams, J. B. ..... Toronto.
Wood, S. T. ..... "
Wright, W. H. ..... Guelph.

Quebec.

Agricultural Editor, *Weekly Witness* ..... Montreal.
Barwick E. C. ..... "
Brainerd, Dwight ..... "
Burgess, T. J. W. ..... "
Chagnon, G. ..... "
Clayson, G. H. ..... "
Dunlop, G. C. ..... "
Du Porte, E. Melville.... Macdonald College.
Earby, A. ..... Montreal.

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QUEBEC.

Greene, L. R. .....Montreal.
Huard, Rev. V. A. .....Quebec.
Lochhead, Prof. .....Macdonald College.
Lyman, H. H. .....Montreal.
Moore, G. A. ..... "
Norris, A. E. ..... "
Southee, G. A. ..... "
Tourchot, A. L. .....St. Hyacinthe.
Winn, A. F. .....Montreal.

ALBERTA.

Baird, Thomas .....High River.
Bentley, Lettice .....Lethbridge.
Dod, F. H. Wolley, ...Midnapore.
Kain, V. L. .....Edmonton.
Moody, Miss .....W. Calgary.
Whitehouse, F. C. .....Red Deer.

MANITOBA.

Criddle, Norman .....Treesbank.
Heath, E. F. .....Cartwright.
Hone, R. .....Manitou.
Hunter, Dr. A. J. .....Teulon.
Wallis, J. B. .....Winnipeg.

NOVA SCOTIA.

Allen, E. C. .....Yarmouth.
Brittain, W. H. .....Truro.
Gooderham, C. B. ..... "
MacKay, Dr. A. H. .....Halifax.
Payne, H. G. .....Granville Ferry.

NEW BRUNSWICK.

Vroom, J. .....St. Stephen.

SASKATCHEWAN.

Androchowicz, E. .....Humboldt.
Neville, S. J. .....Cottonwood.
Willing, Prof. T. N. .....Saskatoon.

BRITISH COLUMBIA.

Abbott, R. C. .....Mission City.
Abbs, A. W. .....Vancouver.
Abriel, T. .....Nakusp.
Anderson, E. M. .....Victoria.
Anderson, J. R. ..... "
Bain, T. H. .....N. Vancouver.
Barnhill, E. .....Kelowna.
Bird, M. .....Vancouver.
Blackmore, C. .....Victoria.
Boncquet, A. .....Vancouver.
Brand, James ..... "
Brealey, A. .....Hatzic.
Bryant, T. .....Ladysmith.
Brydon, J. .....Victoria.
Bush, A. H. .....Vancouver.
Chapman, C. ..... "
Clark, R. ..... "
Cockle, J. .....Kaslo.
Collins, H. .....Grand Forks.
Crease, H. .....Kelowna.
Croker, A. .....Victoria.
Cunningham. T. .....Vancouver.
Davidson, T. .....Vancouver.
Davidson, J. ..... "
Day, G. O. .....Vancouver Is.
Garraway, H. L. .....Vernon.
Gavet, D. .....Vancouver.
Getchell, F. H. .....Vancouver.
Hadwen, Dr. S. .....Mt. Lehman.
Hanham, A. W. .....Duncans Station.
Harvey, R. V. .....Victoria.
Hill-Tout, W. S. .....Abbotsford.
Hoy, B. .....Vernon.
Hunt, E. C. .....Creator.
James, F. T. .....Victoria.
Kendall, J. B. .....Vancouver.
Kennedy, A. B. ..... "
Lang, W. A. .....Peachland.
Lyne, W. H. .....Vancouver.
Marmont, L. E. .....Fraser Mills.
Marriott, E. G. .....Cranbrook.
McHardy, C. F. .....Nelson.
Mengens, Mr. .....Kelowna.
Middleton, M. .....Nelson.
Nicolle, W. ..... "
Norman, P. .....Victoria.
Palmer, R. M. .....Kamloops.
Patch, A. M. .....Vancouver.
Peters, R. .....Victoria.
Pooley, W. R. .....Kelowna.
Reed, E. Baynes .....Victoria.
Reeves, S. H. .....Duncans.
Robertson, W. H. .....Victoria.
Ross, A. H. .....Nelson.
Rowland, A. .....Vancouver.
Ruhman, M. .....Vernon.
Russell, M. W. .....Kelowna.
Scott, W. E. .....Victoria.
Sherman, R. S. .....Vancouver.
Simons, A. E. ..... "
Simms, A. C. .....Summerland.
Skinner, E. M. .....Victoria.
Stanton, T. H. .....Duncans.
Taylor, L. E. .....Kelowna.
Thomson, C. .....W. Summerland.
Treherne, R. C. .....Vancouver.
Venables, E. P. .....Vernon.
De Verteuil, Dr. .....Vancouver.
Wallace, E. A. .....Victoria.
Wilkerson, G. E. ..... "
Wilson, R. M. .....Vancouver.
Winslow, R. M. .....Victoria.
White, E. A. .....Sardis.
Woods, Mrs. E. A. .....Grand Prairie.

HONORARY MEMBERS.

Cockerell, Prof. T. D. A. ..Boulder, Col.
Comstock, Prof. J. H. ....Ithaca, N.Y.
Cresson, Ezra T. .....Philadelphia, Pa.
Felt, Dr. E. P. .....Albany, N.Y.
Howard, Dr. L. O. .....Washington, D.C.
Webster, Prof. F. M. ..... "
Wickham, Prof. H. F. .....Iowa City, Iowa.

LIFE MEMBERS.

Saunders, Dr. Wm. .....London.
Late Director of the Experimental Farms of the Dominion.
Bethune, Rev. C. J. S. .....Guelph.
Professor of Entomology, Ontario Agricultural College.
Fyles, Rev. Dr. T. W. .....Ottawa.
Reed, E. Baynes. .....Victoria.
Director of the Meteorological Station.

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The Entomological Society of Ontario

ANNUAL MEETING

The Fiftieth Annual Meeting of the Society was held at the Ontario Agricultural College, Guelph, on Wednesday, Thursday and Friday, Aug. 27th, 28th and 29th, 1913, and was one of the most important events in the history of the Society.

The President, REV. DR. C. J. S. BETHUNE, though present at all the meetings was unfortunately unable to act in his official capacity on account of defective eyesight. His place in the chair was ably filled by the Vice-President, Dr. C. Gordon Hewitt.

The meetings were attended not only by a large number of the Society's members and visitors from the town, but also by a goodly representation of distinguished entomologists from the United States and Great Britain. Keen regret was felt by all in the absence of Dr. William Saunders, one of the original founders of the Society, whose serious illness prevented him from attending the meetings, as had been expected.

The following were present at the meeting: Prof. J. H. Comstock, Hon. Member, Entomological Dep't., Cornell University, Ithaca, N.Y.; Mrs. J. H. Comstock; Prof. F. M. Webster, Hon. Member, Bureau of Entomology, Washington, D.C.; Dr. E. P. Felt, Hon. Member, State Entomologist, Albany, N.Y.; Dr. R. Stewart MacDougall, University of Edinburgh; Mr. Geoffrey Meade-Waldo, British Museum, London, Eng.; Prof. W. M. Wheeler, Harvard University, Cambridge, Mass.; Prof. T. J. Headlee, State Entomologist, New Brunswick, N.J.; Prof. A. D. MacGillivray, Urbana, Ill.; Prof. P. J. Parrott, Geneva, N.Y.; Mr. de Vyver, Entomological Society of N. Y.; Mr. W. A. Clemens, Ithaca, N.Y.; Dr. C. Gordon Hewitt, Dominion Entomologist, Ottawa; Mrs. C. Gordon Hewitt; The Rev. T. W. Fyles, D.C.L., Ottawa; Mr. and Mrs. Henry H. Lyman, Montreal; Prof. W. Lochhead, Macdonald College, P.Q.; Mr J. C. Chapais, Que. Soc. for the Protection of Plants; Mr. John D. Evans, Trenton, Ont.; Mr. F. J. A. Morris, Peterboro; Dr. E. M. Walker, University of Toronto, Toronto; Mr. J. B. Williams, University Museum, Toronto; Dr. A. Cosens, Parkdale Collegiate Institute, Toronto; Mr. R. S. Hamilton, Galt; Prof. J. Dearness, London; Mr. J. F. Brimley, Grimsby; Messrs. Arthur Gibson, and F. W. L. Sladen, Division of Entomology, Ottawa; the following field agents of the Dominion Division of Entomology: Messrs. Sanders, Tothill, Petch, Ross, Hudson, McLaine; Mr. R. C. Treherne, Vancouver, B.C.

The Ontario Agricultural College was represented by the following: President Creelman, Prof. C. A. Zavitz, Prof. C. J. S. Bethune, Prof. T. D. Jarvis, Prof. Hutt, and Prof. Crow, Mr. L. Caesar, Mr. A. W. Baker, Dr. R. E. Stone, Mr. Wright. Mr. E. J. Zavitz, G. J. Spencer; Messrs. Burroughs, Curran, Good, Hart and others.

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On Wednesday morning a meeting of the Council was held in the Biological Lecture Room, at which, among other matters, certain proposed changes in the constitution of the Society were discussed. These changes, which were afterwards sanctioned at the general meeting, have been included in the copy of the constitution of the Society which appeared in the December number of the Canadian Entomologist.

In the afternoon the members and delegates met in the Massey Hall Auditorium, the proceedings commencing with an address of welcome by President Creelman of the College, after which the congratulatory addresses from the representatives of other societies and institutions were presented.

ADDRESS OF WELCOME.

Dr. G. C. Creelman, President of the Ontario Agricultural College, in a most genial and hearty manner welcomed the members of the Society and the visitors from other lands. He then went on to say:

I see a number of men who were formerly students at this College, now working in different Provinces of the Dominion of Canada. We are delighted to have these men come back to the old college and Province of Ontario, and to the Entomological Society. We are pleased to see so many strong men who have done actual work on our farms. We have been able through our Department of Entomology to give out a large amount of information to the farmer, which he was otherwise unable to get by himself. That would be a good definition for a college: "A place where people are taught things that cannot be taught at home." What you men can do in entomology, etc., farmers are incapable of doing for themselves.

I want to pay a tribute to the scientific men throughout the length and breadth of this and other lands at the present time—the men who have helped agriculture. The farmer usually has been a hewer of wood, as there has been so much necessity for manual labor on the farm, and he has not had time to work out the life histories of the various injurious insects. You have done it for him, and prescribed the remedy, until now by putting down his name, he can get by mail free the thing that is necessary to kill the injurious things on his farm. You have experimented, you have tried it and the farmer gets the results of your labors, at home. It is not always appreciated, even the agricultural press is inclined at times to tell them not to have too much of it; but I think more and more that the scientific man, and the entomologist in particular, is beginning to come in to his own.

I hope to see all here to-night at a reception to be given by Mrs. Creelman and myself at our residence.

The evening was marked by one of the most enjoyable features of the meeting, a reception given to the members by President and Mrs. Creelman at their residence.

On Thursday morning a business meeting was held in the Biological Lecture Room, at which the officers for the ensuing year were elected and several matters of interest to the members were discussed. Of these reference has already been made to the revised constitution of the Society. Among other matters a resolution was passed recommending that the various entomological societies be properly

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represented at the International Congress of Entomology. The Rev. Dr. T. W. Fyles was elected a life member of the Society. Mr. J. M. Swaine and Dr. E. M. Walker were appointed to represent the Entomological Society of Ontario on the American Committee of Nomenclature. It was decided to hold the next Annual Meeting at Toronto, the date to be chosen on a later occasion.

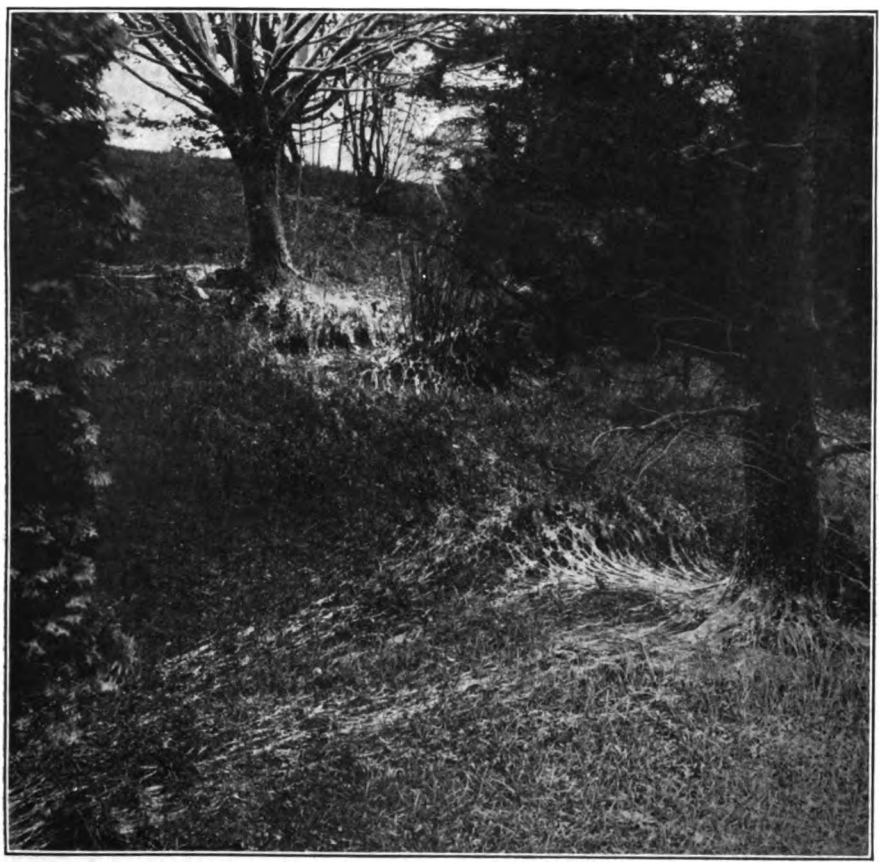

Fig. 1.—Showing remarkable quantity of silk spun by Forest Tent Caterpillars, in moving from tree to tree (original).

REPORTS ON INSECTS OF THE YEAR.

Division No. 1, Ottawa District—Arthur Gibson, Central Experimental Farm, Ottawa.

Unlike the season of 1912, that of 1913 in the Ottawa District was bright, clear, with little rainfall, and in the summer a long continued drought which reduced very considerably hay, corn, roots and other crops. Such a season, of course, was favourable for the development of insect life and some serious outbreaks of well-known forms took place.

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Insects Attacking Field Crops.

Locusts. These insects were abundant in large numbers near Ottawa, particularly in light sandy districts. At Bowesville, about six miles from Ottawa swarms of them were present in oat, barley, timothy, and corn fields, and much damage was effected. Potatoes and beans were also attacked. In August an investigation was made of some of the fields where the locusts were present in thousands, and much destruction was seen. The species chiefly responsible for the damage was the Lesser Migratory Locust, *Melanoplus atlanis*. The Pellucid Locust, *Camnula pellucida*, was the other species present which was doing damage, but this was in much smaller numbers than *M. atlanis*. In some fields poisoned bran had been spread, and while large numbers of the insects were killed, the attack was not by any means stopped. The poisoned bran had been applied after the locusts had acquired their wings. Better results, of course, would have been secured if the application had been made during the hopping stage.

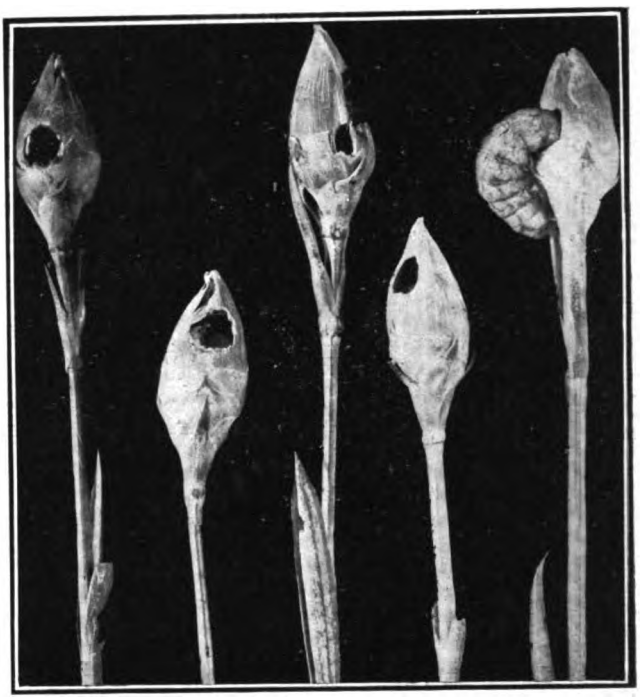

Fig. 2.—Carnation buds eaten out by Variegated Cutworm (original).

Root Maggots. These insects were again prevalent throughout the district. The Cabbage, or Radish Root-Maggot, was frequently complained of as attacking cauliflowers, cabbages, radishes and turnips. The Onion Maggot, also, did considerable damage, but no report of the work of the Seed-corn Maggot was received.

Other common pests, such as Cutworms, Flea-beetles, and White Cabbage Butterfly were present in destructive numbers.

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THE BURDOCK BORER (*Papaipema cataphracta*). Several reports were received of a borer in the stems of tomato, and from specimens collected and received the species was seen to be that which I have commonly called the Burdock Borer, owing to this plant being the favourite food of the larvæ in the Ottawa District. The presence of this borer in tomato, potato, or other plants is usually detected by the unhealthy appearance of the plants, the tops becoming withered and falling down on one side. Cutting off the portion of the plants containing the caterpillar is the only remedy that can be suggested.

ATTACKING FRUIT TREES.

TENT CATERPILLARS. Both species, the American Tent (*Malacosoma americana*) and the Forest Tent (*Malacosoma disstria*) were present in large numbers throughout the district. Apple trees were entirely stripped of foliage, and in many orchards little fruit was gathered. At the Central Experimental Farm where the trees had been regularly sprayed, good crops of apples were secured.

WOOLLY-APHIS-OF-THE-APPLE (*Schizoneura lanigera*). This insect is conspicuously present in some orchards in the district at the present time, and requests have been received for a remedy. Fortunately we have not received any report of injury by the root-infesting form.

THE CODLING MOTH (*Carpocapsa pomonella*) was again present in injurious numbers, as was also the OYSTER-SHELL SCALE (*Lepidosaphes ulmi*). In last year's report I mentioned the occurrence at Ottawa of the adult of the Apple Maggot (*Rhagoletis pomonella*). I am glad to state that no further evidence of the presence of this destructive insect has been seen during the present year.

ATTACKING FOREST AND SHADE TREES.

The chief destructive caterpillar of 1913 was the FOREST TENT CATERPILLAR (*Malacosoma disstria*). During the seasons of 1911, 1912, and 1913 the district of Ottawa has been visited by remarkable outbreaks of the Forest Tent Caterpillar. Miles of forest trees—poplar, birch, maple, etc.—have been stripped bare by the hordes of caterpillars. The outbreak of 1913, however, was not so widespread as that of 1912. As mentioned in my report presented at the last annual meeting of the Society, trains on the Gatineau service of the Canadian Pacific Railway were stopped repeatedly owing to the large numbers of larvæ present on the tracks. This only happened once or twice during the present season. On a part of the grounds of the Central Experimental Farm where several trees were entirely denuded of foliage, conspicuous paths of silk were spun by the larvæ in moving from tree to tree. The photograph reproduced herewith which illustrates remarkably well the quantity of silk spun by the caterpillars was taken by Mr. J. S. Wallace, of the Dominion Observatory. At the time the photograph was taken the larvæ were about a quarter of an inch long. Large numbers of eggs had been deposited on pine and even cedar trees close to an electric arc street light, and when the young larvæ hatched they soon left these trees and made the silken pathways, chiefly towards the large mountain ash tree, standing in the background of the illustration. (See p. 15.)

In 1912 the first moths did not emerge until early in July and the vast numbers not until the middle of the same month. In the present year (1913)

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moths were noticed in numbers at Britannia, near Ottawa, on June 27th; on June 29th thousands were present around the arc lights in Ottawa and flights were also observed in early July.

During the winter of 1912-1913 the eggs of this species were present in countless thousands on shade trees in the streets of Ottawa. During spring and early summer it was an unusual sight to see the large numbers of these trees which had been banded with ordinary tanglefoot fly paper. At the present time there are plenty of eggs on the trees in Ottawa, but fortunately they are not nearly so abundant as they were a year ago.

Attacking Greenhouse and Garden Plants.

The Bordered Sallow (*Pyrrhia umbra*). The caterpillars of this noctuid moth, which are green, spotted with black, have the habit of eating into buds of roses and other garden plants. During the past season roses particularly were reported as being injured.

Root-Infesting Aphid. Several complaints were received of an aphis attacking the roots of asters. One complaint reached me on Aug 7th which stated that whole plots of asters had been destroyed in some gardens in Ottawa. Asters on the grounds of the Experimental Farm were also injured apparently by the same species.

Red Spider. In dry seasons, such as that of 1913, the so-called red spider is usually very prevalent. During the past season very serious injury was caused by these mites to a large number of different kinds of garden plants, particularly sweet peas. The injury was very apparent in the middle of August.

Cutworms in Greenhouses. Occasionally we receive reports of injury by cutworms in greenhouses. One of the most interesting of these which has come to my notice, occurred in the carnation house of one of our Ottawa florists. During the winter when the injury was noticed I visited the greenhouse and found that the species responsible for the damage was the Variegated Cutworm (*Peridroma saucia*). Practically the only injury was to the buds which were in many instances entirely eaten out during the night by the caterpillars, as shown in the photograph reproduced herewith (Fig. 6). Cutworms in greenhouses can easily be controlled by scattering poisoned bran wherever they occur.

Division No. 3, Toronto District—A. Cosens.

The season of 1913 should go on record as a very favourable one for collecting. Long spells of fine weather, broken only for short intervals by occasional showers have characterized the summer. The autumn has been exceptionally warm, and insect activity has been correspondingly prolonged. A Mourning Cloak butterfly (*Vanessa antiopa*, L.) had sufficient energy to flutter about in the enjoyment of the warm sunshine of November 3rd, and numerous Crane Flies (*Trichocera maculipennis*, Fabr.) were still zig-zagging in the smoky air on November 13th.

The Tussock Moth was much more plentiful in Parkdale this season than it has been any previous one. The cocoons were formed even in crevices of the foundations of houses and under stone window sills; besides such unlikely places they were plentiful along the fences, and in some trees they were literally massed at the axils of the branches. If this species were not extensively parasitized the

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introduction of suitable parasites would be considered the proper solution of the problem, and a campaign might be suggested similar to that being carried on at present against the Gypsy and Brown-Tail Moths. Since the natural check is already firmly established, care should be taken to assist, not to counteract it, by the artificial means used to bring the pest under control.

Until this season I have not been successful in breeding *Saperda concolor*, Lec., from its galls, although I have collected swellings on the stems of poplar and willow with the utmost confidence on several previous occasions. The galls from which the beetles were finally secured occurred on the stems of *Populus balsamifera*, L., usually on small second-growth material. The swellings were ellipsoidal to spherical in form, and averaged about 2 cm. in length, the width varying with the size of the affected branch. The tunnels of the larvæ were on an average 15 mm. in length by 4 mm. in diameter and passed almost straight along the centre of the stem. In external form the gall closely resembles that produced on *Populus tremuloides*, Michx., by the Clear-wing Moth, *Memythrus tricinctus*, Harris. The beetles emerged early in May. In the locality where found the galls were abundant enough to seriously damage the smaller specimens of the host. Judging from my experience with this beetle a number of the swellings on poplar and willow commonly ascribed to it must derive their stimulus from other sources probably bacterial or fungal in character.

Another interesting gall not previously reported from this locality is that produced on various species of poplar by the moth *Ectoedemia populella*, Busck. I collected this gall several years ago on *Populus deltoides*, Marsh., growing in the scanty soil of a small rocky island near Hutton House, Muskoka, but did not obtain it at Toronto until the present season. It is here found on *Populus grandidentata*, Michx. The gall has not the spindle shape that we commonly associate with the Lepidopterous type, but is nearly globular in form. It originates by a swelling of the petiole of the leaf close to its junction with the blade.

The following list includes all the other Lepidopterous gall producers, as far as reported from this vicinity:

Ecdytolopha insiticiana, Zeller.
Host, *Robinia pseudo-acacia*, L.

Eucosma scudderiana, Clemens.
Hosts, *Solidago canadensis*, L.
" *serotina*, var. *gigantea*, Gray.

Gnorimoschema gallaesolidaginis, Riley.
Hosts, *Solidago canadensis*, L.
" *serotina*, var. *gigantea*, Gray.
" *rugosa*, Mill.

Gnorimoschema gallaeasterella, Kellicott.
Hosts, *Solidago latifolia*, L.
" *caesia*, var. *axillaris*, Gray.

Memythrus tricinctus, Harris.
Host, *Populus tremuloides*, Michx.

Stagmatophora ceanothiella, Cosens.
Host, *Ceanothus americanus*, L.

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Complaints from amateur rose-growers, early in the season, led to an examination of several dead stalks from rose bushes. In almost every case a row of larvæ was found occupying the pith. These were arranged with surprising regularity, each one occupying nearly the same space and separated from the next by only a thin partition. The moths that emerged from the affected twigs proved to be *Ceratophorus tenax,* Fox. Concerning this species S. A. Rohwer writes: "As a rule it cannot be classed as an injurious insect, as it attacks twigs which have been pruned, in preference to making its own holes, and pruned twigs can be treated by painting the end with almost any kind of paint, or putting a small tack down the pith."

Leaves on *Populus grandidentata,* Michx., slightly rolled from one edge towards the midrib and almost parallel to it were found to contain larvæ of a sawfly. These pupated in the soil of the breeding jar and emerged about the middle of July. The species were found to be *Pontania populi,* Marlatt. The identification of this and the preceding species I owe to the kindness of S. A. Rohwer, Washington.

This season has been a suitable one for the production of aphids. On the American Elm numerous clusters of leaves rolled and massed together indicate the activity of *Schizoneura americana,* Riley, while along frost cracks and other breaks in the superficial tissues frequent lines and masses of white pubescence show that *Schizoneura rileyi,* Thomas, has there found favourable places for the establishment of colonies. The many specimens of Scotch Elm, *Ulmus glabra,* Huds., furnish a host for a distinct form of aphid. The individual leaves are rolled from one side in this case, and the part included in the roll is distinctly lighter in colour. For several years a large number of leaves have fallen in July and August from our Norway Maples, *Acer platanoides,* L. This has been particularly well marked this season. When the leaves are examined small colonies of plant lice are found along the line of the midrib and the principal veins. The larvæ are light green in color, but the adults, while still retaining the green as a ground color, are distinguished by a comparatively wide, red, median band on the thorax and a V-shaped one on the abdomen, the open part of the V pointing forward. The "honey-dew" from the aphids gives the leaves a varnished appearance and often is so plentiful as to drip from them to the sidewalk. *Populus grandidentata,* Michx., is attacked in a similar way by a closely related species of aphid, but in this case the leaves do not become detached from the tree.

The larvæ of the following moths were common this season on the hosts indicated:—

Archips fractivittana, Clemens.—Host, Crataegus.—The larva draws several leaves of the host together with silk threads and feeds within the shelter thus formed.

Acleris fractivittana, Clemens.—Host, a cultivated Double-white Lilac.—The leaves are drawn together by the larva as in the preceding species.

Pyrausta sp., near to or *thestealis,* Walker.—Host, *Corylus rostrata,* Ait.—The larva rolls up single leaves along a line almost parallel to the midrib.

Anacampsis populella, Clemens.—Host, *Populus grandidentata,* Michx.—Single leaves of the host are rolled up as in the preceding species.

Acleris heindelana, Fernald.—An inquiline in the gall formed by *Rhabdophaga rhodoides,* Walsh, on *Salix humilis,* Marsh. This moth avails itself of leaves already massed by the stimulus of the gall producer, and thus escapes the

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necessity of drawing them together with silk threads. A larger and darker form, bred from leaves of *Salix cordata,* Muhl., that had been drawn together, has been identified as probably the same species. If the examination of more material substantiates this concluson, it shows the inquilinous habit is not firmly established.

For the identification of the above Lepidopterous forms I am indebted to August Busck, Washington, D.C.

DIVISION NO. 5, PORT HOPE.—F. J. A. MORRIS, PETERBOROUGH.

1. ECONOMIC ENTOMOLOGY.—This last season the Tent Caterpillar was prevalent and did great damage to foliage. The prolific "nursery" for this creature seems to be the wild shrubs and trees of cherry and kindred species bordering farm, fields and woodlands. Such trees and shrubbs are abundant, and are universally neglected by the farmers. From them comes the supply that eventually makes its way into neglected orchards and causes such unsightly havoc to the foliage. This season the newly-hatched larvæ were observed at work early in May destroying the buds before the leaves unfolded. They were specially abundant north of here, from five to thirty miles north of Lake Ontario, *e.g.,* Bethel, Garden Hill, and Peterborough. In June they had stripped the trees in some abandoned orchards entirely bare, and larvæ nearly full-grown had spread (in search of food) to adjoining lanes and woodlands. Specimens of the American Tent Caterpillar were as common in a hardwood bush between Garden Hill and Carmel as those of the Forest Tent Caterpillar, and were found—shortly before pupation—thriving on the leaves of maple, oak, basswood, birch, and hazel. If it became the practice among farmers to exterminate from their fence borders all cherry, hawthorn, and other kindred seedlings and shrubs, or at least to burn off the webs early in May, this would go a great way towards stopping the pest at its source.

In some of the gardens about town complaints were heard of a larva eating dahlia buds. Some of the shade trees in residential quarters were badly disfigured by "blight"—the work of the cotton-tail louse. Both species of asparagus beetles were more abundant than ever in the district, and were found on wild plants several miles distant from the town as well as in cultivated crops, but apparently the damage caused by the insect is trivial. The "railroad" worm was almost absent, a reaction after the extraordinary prevalence of three and two years ago; the potato beetle, also, was conspicuous by its absence.

Another pest very noticeable this year was the aphis. Nasturtiums were infested by a black aphid which so weakened the plants that after the drought began in the middle of July the foliage shrivelled and died. In apple orchards much havoc was wrought by a green aphid. It attacked the foliage and fruit and so weakened vitality that trees hitherto good bearers produced nothing but bunches of small clustered apples which failed to mature; moreover, of those that ripened normally many were spoiled for market by their appearance, being stained and streaked with a dark secretion from the insect. Unfortunately, well-kept orchards suffered most from these tiny epicures. Mr. Duncan, of the Department of Agriculture, estimated the loss in a ten-acre orchard of his own at above $150. He used with good results a kerosene emulsion; another remedy is a tobacco preparation known as "Black Leaf 40."

The "white grub," responsible for much local damage in recent years was less prevalent in 1913, though some reported loss to potato and grass crops due to this larva of the June beetle.

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2. JUVENILE OR AMATEUR ENTOMOLOGY.—Through Mr. Duncan's energies great activity obtains among the school children in making collections of various kinds. In addition to the usual inducements for pupils to make collections of weeds, seeds, etc., for exhibit at show fairs in the fall, prizes were offered for exhibits showing the work and life history of various insect pests. There were also prizes offered for collections of insects beneficial and injurious. This has been the custom for some years in our district, but the exhibits were more numerous and better this year than ever before. For instance, the exhibitor who carried off first prize in 1911 and 1912 entered the lists to compete with the prize collection of 1911 and 1912 augmented by specimens taken in 1913 and yet failed to get even a third place. Altogether, there were eight collections at the Port Hope Show Fair and six at the Millbrook, besides eight and seven respectively at the two rural show fairs for South Hope and Cavan, the one held in Welcome and the other at Whitfield. Some exhibits were entered at two fairs, but altogether more than twenty different collections of insects were judged. Many of these were quite extensive, representing several orders of insects, and the best exhibits showed skill in mounting, as well as care and taste in arranging.

Adult collectors generally complain that the season of 1913 was a bad one for the enthusiast. In Coleoptera neither Dr. Watson nor your District Director made many captures worthy of note, as new or rare. In Lepidoptera we have two very active collectors in Mr. Charles Mann and Mr. H. L. Bowers of the Standard Ideal Company. The latter, especially, is a fine entomologist and has sent several most interesting batches of Lepidoptera to Mr. Evans, of Trenton, for identification. He reports the season as disappointing:

"All butterflies and most of our locally common moths were scarce. *Anosia plexippus,* Linn., common in 1912, occurred hardly at all. Our representatives of the *Argynnis* family, which in 1912 appeared to reach a numerical zenith, fell to the nadir in 1913. This observation applies also to *Brenthis, Phyciodes. Satyrus, Vanessa, Grapto, Papilio,* and *Colias. Pieris rapae* was abundant as usual, and *protodice* was taken several times. *P. napi* remains constant in restricted localities.

"Interesting takes were *Phyciodes batesi,* Reak; *Cœnonympha inornata,* Edw.; *Amblyscirtes samoset,* Scudd.; *Thecla acadica,* Edw.; *T. liparops,* B. and L.; *T. niphon,* Hubn.; *Colias interior,* Edw.; *Papilio ajax.*

"Sugaring, the electric lights, and a light-trap were all comparative failures, though in 1912 they had been very successful, the last-named method especially in microlepidoptera.

"In the fall of 1912 moths of *Malacosoma americana* were extremely abundant. 1913 showed the result in that practically every haw and wild cherry tree had from one to five nests. Some means should be taken to cut off this supply furnished by wild food-plants. Moths of the cut-worm family were scarce; also those of the woolly-bear group. Very few of the fall web-worm were taken. Leaf-rollers, usually abundant, were scarce. Spring and fall canker-worms are not numerous about Port Hope. The abundance of *Celerio intermedia* was noticeable. Some 50 caterpllars were taken from a small patch of *Epilobium actinocaulon.* Tomato-hawks were scarce. As said before, the year was a failure from a collector's standpoint. With the exception of the tent-caterpillars, I do not know of any Lepidopterous larvæ that have caused serious depredations."

Mr. Bowers closes his letter with a list of over twenty interesting captures made this season. His list is on file, but is withheld owing to probable exigencies of space.

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DIVISION NO. 7. NIAGARA DISTRICT—W. A. ROSS, JORDAN HARBOUR.

INSECTS OF THE YEAR. As I was absent from the Niagara District during the greater part of 1913, I am not in a position to do justice to a report on "Insects of the Year in Division 7," and so in place of the customary report I shall present brief notes on some insects which were of particular interest to me this past season.

Orchard Pests.

APPLE MAGGOT (*Rhagoletis pomonella*). This insect was remarkably scarce last summer in most sections of Ontario. In orchards which were badly infested two and three years ago I had often to search quite diligently to secure a few adults. It will undoubtedly interest the members of the Society to learn that the Apple Maggot may remain in the soil in the pupal stage for two years. During the month of July, five females and four males emerged from the soil in rearing-cages in which 1911 pupæ were placed during the spring of 1912. To corroborate this important point, I examined four of this year's rearing-cages after the adults had ceased emerging, and in the first I recovered twelve per cent. of the pupæ placed there in the spring; in the second, ten per cent.; in the third, eighteen per cent., and in the fourth, ten per cent. These pupæ seemed to be perfectly healthy.

APPLE APHIDS. The question which I had to answer most frequently this summer, while I was in Durham and Northumberland counties, was: "How are aphids controlled?" Apple trees in these two counties were very badly infested with plant lice. Even in well-cared-for orchards it was no uncommon sight to see the work of these creatures in the form of clusters of dwarfed apples.

Four species of Apple Aphids occur in Ontario: The Apple Aphis, *A. pomi*, the Grain Aphis, *Hydaphis* (*Siphocoryne*) *avenæ*, the Rosy Apple Aphid, *Aphis sorbi* and the Woolly Apple Aphid, *Schizoneura lanigera*.

In regard to a remedy for aphids, there is a great need for an insecticide as effective as "Black Leaf 40" but not so costly, and which can be applied with lime sulphur.

GREEN PEACH APHIS (*Myzus persicæ*). During late September and early October the return migrants of this species were remarkably abundant in the Vineland District. On bright days the air seemed to be full of them. However, fortunately for the fruit grower the vast majority of these plant lice were destroyed by predaceous and parasitic insects, by spiders (I observed thousands of alate forms caught in the nets of Orb-weavers) and by a fungus *Entomophthora aphides* (?).

Greenhouse Pests.

SOWBUGS. Although sowbugs are not insects, they are closely enough related to the hexapods to be of interest to entomologists, and therefore the following notes will not be out of place in an entomological report.

Sowbugs were exceedingly troublesome during the fall of 1912 and the spring of 1913 in the greenhouses of J. Gammage and Sons, London, Ont. Owing to their depredations the carnations were stunted and backward in growth, and the sweet peas had to be sown again. The seedlings of Asparagus plumosus, Primula obconica, Petunia, Lobelia, Solanum capsicum and of many other plants were badly attacked. Tender cuttings, such as those of begonia and coleus, were also severely injured.

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I collected three species of isopods in these infested greenhouses: *Armadillidum vulgare, A. quadrifrons* and *Oniscus asellus.*

Systematic trapping by means of inverted flower pots containing damp hay will very materially reduce the number of sowbugs.

A poisoned bait composed of:

2 parts rye flour or Bibby's Calf Meal.
2 parts sugar.
1 part Paris green.

is also an effective remedy.

The tarring of branches is to be recommended, as coal tar, when fresh, acts as a repellant, and as it also preserves the wood it thus deprives the isopods of their favorite harbour—rotten wood.

Large numbers of sowbugs may be destroyed by pouring hot water into the crevices and cracks in wooden partitions and benches; by applying it along the edges of greenhouse beds where numerous "bugs" lie concealed; and by flushing cleared benches and the ground beneath them with it. This method can, of course, be used to greatest advantage where the watering system can be temporarily connected with a boiler or where the steam or hot water pipes can be tapped.

The destruction of all rubbish in and around greenhouses is a very important means of prevention.

TARNISHED PLANT-BUG, (*Lygus pratensis*). This past year the Tarnished Plant-Bug, masquerading under the name of the Aster Bug, has been far the most serious pest in many Ontario florist's establishments. By its depredations on chrysanthemums and asters it has been responsible for the loss of hundreds of dollars. In reference to this, the manager of the Dale Estate, Brampton, writes: "A conservative estimate of our loss on chrysanthemums this last season would be $2,000, and on asters, $500."

Dr. Chittenden, of the United States Bureau of Entomology, recommends spraying with a mixture of Black Leaf 40 and Whale Oil Soap as an effective means of controlling this capsid. The keeping down of weeds and the destruction of all rubbish in and around greenhouses is an important preventive measure.

TRUE BULB MITE, (*Rhizoglyphus hyacinthi*). While in London, Ont., last February, Mr. Gammage, of J. Gammage & Sons, drew my attention to the unhealthy condition of a large percentage of his Easter lilies. The foliage of the diseased plants was sickly, yellowish-green in color and was usually streaked and spotted with light markings. So badly affected were some of the lilies that Mr. Gammage found it necessary to throw out over a thousand of them.

I examined several of the diseased specimens, and in every case I found small translucent mites with brown appendages working in pockets and passages in the bulb, and in many instances, in the stem. These mites were determined by Dr. Nathan Banks as *Rhizoglyphus hyacinthi* Boisduv. As this species works on many kinds of bulbs and will attack perfectly healthy ones, I am inclined to believe that it was the primary cause of the unhealthy condition of the lilies.

CATTLEYA FLY, (*Isosoma orchidearum*). Early in the year this small hymenopterous fly was reported as being very troublesome in Thomas Manton's orchid house at Eglinton. The female, according to Mr. George Manton, oviposits in the young shoots of the Cattleya plants and the larvæ feed on the orchid substance.

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Garden Insects.

CORN ROOT APHIS, (*Aphis maidi-radicis*). Last summer cultivated asters in a Bowmanville garden were very seriously injured by root aphids belonging to the species *Aphis maidi-radicis.*

BEET LEAF MINER, (*Pegomyia vicina*). The work of this maggot on the leaves of beets was very conspicuous during the summer and fall in many Bowmanville gardens. The fly oviposits on the under surface of the leaf; the larva burrows into the tissues and mines just beneath the upper epidermis. When mature, it drops to the ground and transforms in the soil. From casual observations which I made on this fly I am inclined to think that it has several generations each year in Ontario.

Lecanium corni. During July I came across a number of thimble berry bushes very badly infested with this scale. This *Lecanium* is usually so heavily parasitized that it is seldom serious. Lime sulphur wash, applied after the leaves have dropped and again before the buds have opened in the spring, is an effective remedial measure.

Miscellaneous.

ELM SCHIZONEURANS. Some elm trees in Durham county were badly infested last spring with the leaf-curling species *Schizoneura lanigera* (*americana*).

It will be of interest to note here that during the month of October I secured, on the bark of *Ulmus campestris,* fall migrants of the other elm leaf aphid *S. ulmi* (*foediens*) to which Miss Patch refers in: "A Note on Two Elm Leaf Aphids"—*Journal of Economic Entomology,* Volume 6, Number 3, 1913.

MEDITERRANEAN FLOUR MOTH, (*Ephestia kuehniella*). This insect is still imposing a heavy tax on the milling industry and feed trade in Ontario, and it seems to me that the toll is becoming heavier each year. It was particularly troublesome this autumn in a large feed store in Dundas. When I visited this store, I found all the meal and flour literally alive with caterpillars. The moth had been brought into the building in a shipment of corn meal.

Undoubtedly where superheating is practicable it is the most effective method of ridding the mill or store of this scourge. A temperature above 120 degrees Fahrenheit, maintained for at least ten hours will prove fatal to all the adults, caterpillars and eggs of *Ephestia.*

In using the superheating remedy the following precautions are important:

1. No bags of infested meal or flour should be left on the basement floor, as difficulty is often experienced in raising the temperature of this floor to a fatal point.

2. Bags of meal or flour should not be superheated when in piles, but each bag should stand separate so that the heated air can circulate freely around it.

3. Belting and anything else liable to be injured by excessive heat should be removed from the building.

4. Thermometers registering over 120 degrees Fahrenheit or 50 degrees Centigrade should be placed in different parts of the building to insure thorough work.

5. When it is found impossible to maintain a fatal temperature on the basement floor, the same should be scalded with hot water to destroy any caterpillars which might have dropped there.

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REPORT OF THE COUNCIL.

The Council of the Entomological Society begs to present its report for the year 1912-13.

The 49th annual meeting of the Society was held at Ottawa on Tuesday and Wednesday, November 19th and 20th, 1912. The day meetings were held at the Carnegie library and the chair was occupied by the President, Dr. E. M. Walker. In the evening a meeting was held at the Normal School and presided over by the Honorable Martin Burrell, Minister of Agriculture for the Dominion. There were a number of members present from a distance and a good attendance of those resident in Ottawa. During the first morning a meeting of the Council took place at the Experimental Farm. A committee was then appointed to consider certain changes in the constitution of the Society which were proposed at a recent meeting at Guelph. Arrangements were also made for marking the Society's 50th Annual Meeting by holding the Jubilee celebration at Guelph and inviting delegates from other societies and institutions. A special committee was appointed to take charge of the arrangements in connection with the meeting. In the afternoon the reports of the Directors on the insects of the year, and of the Montreal, Toronto and British Columbia Branches were read and discussed. The President, Dr. Walker, delivered the annual address, on the "Faunal Zones of Canada." Dr. Hewitt gave a review of Canadian entomology for 1912, in which he described the work of the Division for the year and of the valuable results that had already followed the establishment of field stations. Prof. Lochhead gave an address on the teaching of Entomology in the Agricultural Colleges. Dr. Fyles read one of his charming papers on the "Rise in Public Estimation of the Science of Entomology."

A public meeting was held in the evening in the auditorium of the Normal School. After an introductory address by the Chairman, the Honorable Martin Burrell, Mr. F. W. L. Sladen, of the Division of Entomology, gave a very interesting and instructive lecture on "Bumble Bees and their Ways," illustrated by a number of beautiful lantern slides.

On Wednesday the following papers were read: "The Chinch Bug in Ontario," by Mr. H. F. Hudson; "The Importation and Establishment of Predaceous Enemies of the Brown-tail Moth in New Brunswick," by Mr. J. D. Tothill; "The Discovery of the San José Scale in Nova Scotia," by Mr. G. E. Sanders; "Observations on the Effect of Climatic Conditions on the Brown-tail Moth in Canada," by Messrs. Tothill and Sanders; "Observations on the Apple Maggot in Ontario in 1912," by Mr. W. A. Ross; "Notes on Injurious Orchard Insects in Quebec in 1912," by Mr. C. E. Petch; "Insects of the Season in Ontario," by Mr. L. Cæsar; "Injurious Insects in Quebec for the year 1912," by Prof. W. Lochhead; "Forest Insects in Canada in 1912," by Mr. J. M. Swaine; "The Elater Beetles," by Mr. G. Beaulieu; "Aquatic Insects," by Dr. R. Matheson; "The Entomological Record for 1912," and "Flea Beetles and their Control," by Mr. A. Gibson; "Insect Pests of Southern Manitoba during 1912," by Mr. Norman Criddle; "Some New and Unrecorded Ontario Fruit Pests" and "Arsenite of Zinc as a Substitute for Arsenate of Lead," by Mr. L. Cæsar. A special feature of the meeting was an interesting address by Mr. J. H. Grisdale, Director of the Dominion Experimental Farms, in which a keen appreciation was shown of the work that is now being done in Canada in Economic Entomology.

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The Canadian Entomologist, the monthly journal of the Society has been issued regularly each month. The forty-fourth volume was completed in December last. It consisted of 378 pages and was illustrated by a number of full page plates and many original drawings. The contributors numbered 53 and included writers in Ontario, Quebec, New Brunswick, Manitoba, Alberta, Australia, Peru and many states of the Union.

Meetings of the Society were held on alternate Thursday afternoons during winter months in the Biological classroom of the Ontario Agricultural College, and much interest was shown by students of the four years. The average attendance at the meetings was fourteen. The following subjects were taken up and discussed: "The Insects of the Season in Ontario," by Mr. L. Cæsar; "Some Notes on the House Fly," by G. J. Spencer; "The Apple Maggot," by C. A. Good; "Strepsiptera" by A. W. Baker; "The Anatomy of the Honey Bee," by J. C. Millen; "The Role of Insects in the Spread of Fire Blight" by D. Jones; "The Thrips of Ontario," by J. W. Noble; "Entomological Work in Kansas," by Mr. R. Fraser.

The reports of the Branches of the Society at Montreal and Toronto showed that meetings had been regularly held and much active work had been performed. The Council are gratified at being able to report the great increase in the number of members of the British Columbia branch due to the active work carried on by Mr. R. C. Treherne. The Council has much pleasure also in reporting that the total number of new members joining the Society during the past year has amounted to one hundred. The Council wishes to express its gratification at the number who have now assembled in celebration of the Jubilee meeting of the Society which will make this gathering a memorable occasion. It extends a hearty welcome to all our visitors from a distance and trusts that they will enjoy their visit to Guelph.

REPORT OF THE MONTREAL BRANCH.

The fortieth annual meeting of the Montreal Branch was held at 74 McTavish St., on Saturday evening, May 17th.

Members present: Messrs. G. A. Southie, G. Chagnon, H. H. Lyman, A. F. Winn, E. C. Barwick, G. H. Clayson, Geo. A. Moore.

The minutes of the April meeting and of the last annual meeting were read and confirmed. Mr. G. M. Henderson was elected a member of the Branch.

The Secretary read the following:

Report of the Council.

Eight meetings have been held during the season of 1912-13, the average attendance being over six. Two members have been added.

The following papers were read (most of which were illustrated by specimens) and each was thoroughly discussed.

Annual Address of President, G. A. Southee; "The Newman Relaxing Jar," A. F. Winn; "Hibernation of Some Butterflies," A. F. Winn; "Collecting Erebia Cassiope in the English Lake District," L. Gibb; "Collecting at Newago, Que.," G. A. Southee; "Notes on Hepialus Mustelinus," G. A. Southee; "Gelastocoridae or Toad-shaped Bugs," Geo. A. Moore; "Notes on the Eastern Species of Gonodontes," A. F. Winn; "The Second International Congress of Entomology," H. H. Lyman; "Gynandromorphous Butterflies," L. Gibb; "Melanolophia Canadaria and its Allies," A. F. Winn; "The Distribution of Heteroptera," Geo. A. Moore.

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The exceptionally rainy season made 1912 a most disappointing year for entomological outings, and this doubtless in part accounts for the falling off in the number of papers read, and the apparent lack of interest. It might be advantageous if the incoming Council, instead of waiting until the fall to plan a programme, could arrange during this month a list of at least one subject for a paper for each monthly meeting, and also appoint a committee of two or three to try and arrange some outings for holidays, or Saturday afternoons. A record of any notable captures made on such trips should be kept.

At the annual meeting of the parent society, the branch was represented by Mr. H. H. Lyman and Mr. A. F. Winn.

The first part of the list of insects of the Province of Quebec, comprising the Lepidoptera, has been published and distributed by the Quebec Society for the Protection of Plants. This was compiled and edited by Mr. A. F. Winn. It is hoped that the members of the Branch will endeavor to get the parts dealing with the other orders ready as soon as possible.

The Treasurer's report shows a balance of $77.86 on hand.

A copy of Dr. Walker's monograph of the Genus Aeshna has been presented to our Society for our library.

Respectfully submitted on behalf of the Council.

(Signed) A. F. WINN, Secretary.

The retiring President, Mr. G. A. Southee, read his annual address, after which the election of officers for the ensuing year was proceeded with and which resulted as follows:

President..... A. F. WINN.
Vice-President..... G. CHAGNON.
Secretary.....GEO. A. MOORE.
Treasurer and Curator.....H. H. LYMAN.
Council.....G. A. SOUTHEE, E. C. BARWICK, G. H. CLAYSON.

Mr. A. F. Winn exhibited a jar of larvæ of *Haploa confusa* found that afternoon at Notre Dame de Grace. Mr. H. H. Lyman exhibited a certificate of an honor recently bestowed upon him, that of being elected Fellow of the American Association for Advancement of Science. He received the congratulations of all present.

The meeting then adjourned.

GEO. A. MOORE, Secretary.

REPORT OF THE TORONTO BRANCH.

The seventeenth annual meeting of the Society was held on Tuesday, June 10, 1913, in the Biological Building, the President, Dr. Cosens, in the chair. The members present were Dr. Cosens, Dr. Walker, Messrs. Snazelle, Williams, Auden, Logier, and Smith. After routine business of regular meetings was disposed of the Secretary read the report of the Council.

Ten meetings in all, including a special business one and the final business one, were held during the season 1912-13. An open meeting was held in January. Dr. Walker had arranged in the Biological Museum the collection of Forest Insects and their work, which he has been making for the Forestry Department of the Uni-

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versity. It already contains illustrations of the important forest pests. There was a large attendance of visitors, and Dr. Walker gave an interesting lecture descriptive of the collection. The whole museum was open after the meeting for inspection of those present.

The average attendance at the other meetings was eight. A number of exceptionally interesting papers have been given and have been much appreciated by the members. The titles are as follows:

Nov. 14.—Dr. Walker, "The Map of the Faunal Zones of North America." Paul Hahn, Report of the successful campaign against the Tussock Moth in Toronto.

Dec. 12.—Dr. Cosens, "The Entomologist in Fiction."

Jan. 9.—Dr. Walker, "Forest Insects."

Feb. 20.—V. Jackson, "New Zealand Insects."

Mar. 13.—J. B. Williams, "Butterfly Hunting in Many Lands, by Langstaff." Dr. Walker, "Present State of our Knowledge of the Insect Fauna of Toronto District."

April 10.—W. A. Clemens, "May Flies."

May 8.—Dr. Cosens, "Lantern Slides, illustrating the Structure of some Insect Galls."

June 10.—Dr. Walker, "The introduction of Parasites in the Control of the Gypsy and Brown-tailed Moths."

Field meetings were held on May 3rd at York Mills, and on May 24th at Mount Dennis. At York Mills, many galls of *Rhabdophaga strobiloides* were found containing eggs of a *Xiphidium*, probably *ensiferum*. At Mount Dennis a dragonfly, *Ophiogomphus rupinsulensis* was captured; this is new to the Toronto district.

Five new members have joined the branch during the year, and two members have resigned. The year has been unusually successful financially.

Mr. Williams submitted the report of the Librarian. The Branch subscribes for The Entomological News and for The Annals of the Entomological Society of America. The publications of the Bureau of Entomology at Washington and the Entomological Reports from the New York State Museum at Albany have also been regularly received.

The election of officers resulted as follows:—

President..... Dr. A. Cosens.
Vice-President..... Dr. E. M. Walker.
Secretary-Treasurer....E. H. Craigie, 40 Leopold St.
Librarian..... W. Logier.
Council..... J. B. Williams, V. Jackson, C. W. Nash, Arthur Smith.

Respectfully submitted,

E. H. Craigie,

Secretary.

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REPORT OF THE CURATOR.

While the Society's collections have been examined regularly throughout the past year and kept in order, with the exception of a few Diptera, they have had no additions made to them. Correctly named specimens of Hymenoptera, Diptera, and Hemiptera are badly needed, and gifts of specimens from members who have them to spare would be greatly appreciated. The collections have been frequently used by fourth year students for identification purposes, and by a considerable number of visiting members.

Respectfully submitted,

G. J. SPENCER, Curator.

REPORT OF THE LIBRARIAN.

During the year ending October 31st, 1913, 32 bound volumes have been added to the library, making the total number on the register 2,185. There have also been added a large number of periodicals and other publications of scientific societies throughout the world as well as bulletins and pamphlets. These are classified so as to be available for reference. Amongst the additions to the library may be mentioned the following: "Catalogue of Lepidoptera Phalænæ in the British Museum," Vols. 11 and 12 by Sir George Hampson; "The Humble Bee," by F. W. L. Sladen; "Aquatic Insects in New York State," by Professor Needham and others; "Entomology with Reference to its Biological and Other Aspects," 2nd edition, by J. W. Folsom; "Social Life in the Insect World," by J. H. Fabre; "Handbuch der Pflanzenkrankheiten," by Professor Paul Sorauer.

The library continues to be largely used by the Biological students and staff of the Ontario Agricultural College and is of great assistance to them in their scientific investigations. Want of space unfortunately prevents a proper classification being made of the books and they are consequently not arranged in a satisfactory order.

Respectfully submitted,

CHARLES J. S. BETHUNE,

Librarian.

REPORT OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO TO THE ROYAL SOCIETY OF CANADA.

W. LOCHHEAD, MACDONALD COLLEGE, QUE.

As delegate of the Entomological Society of Ontario I have the honour of presenting the following Report:

The work of the Society during the past year has been attended with the usual success. The number of active workers has increased in recent years, due to the demand for investigation into the losses caused by the increased number of insect pests that prey upon the crops of the farm, orchard, garden and forest. The great

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expansion of agriculture in Canada and the attendant extension of trade with various parts of the world have brought the study of economic entomology into greater prominence than formerly. New pests threaten us, and old ones demand further investigation. There is a pressing demand for the discovery of more effective methods of control which call for men of considerable practical knowledge of the various branches of agriculture and a thorough grounding in entomology and related subjects. Fortunately our Agricultural Colleges are turning out such men, but the demand is still greater than the supply.

In order to cope with the work in hand, new lines of investigation are being followed. For example, trained men are now located at field stations in infested areas, where they are able to study the pests at work, learn their habits and life history, and work out effective methods of control. Attention is being given also to the breeding of parasitic insects which prey upon injurious forms with the hope of restoring the balance which has been disturbed. Along these lines the Society with its many trained men is doing active work.

The forty-ninth annual meeting of the Society was held in the Carnegie Library, Ottawa, November 19th and 20th last, with a large attendance of members present. An account of the papers read will be found in the forty-third Annual Report of the Society soon to appear.

The titles of the papers are:

"Faunal Zones of Canada," by Dr. E. M. Walker (President's Address).
"Review of Canadian Entomology for 1912," by Dr. Hewitt.
"The Teaching of Entomology in the Agricultural College," by Prof. Lochhead.
"The Rise in Public Estimation of the Science of Entomology," by Rev. Dr. Fyles.
"Bumble-Bees and Their Ways," by F. W. L. Sladen (Public Lecture).
"The Chinch-Bug in Ontario," by H. F. Hudson.
"The Importation and Establishment of Predaceous Enemies of the Brown-tail Moth in New Brunswick," by J. D. Tothill.
"The Discovery of the San José Scale in Nova Scotia," by G. E. Sanders.
"Observations on the Effect of Climatic Conditions on the Brown-tail Moth in Canada," by Messrs. Tothill and Sanders.
"Observations on the Apple Maggot in Ontario in 1912," by W. A. Ross.
"Notes on Injurious Orchard Insects in Quebec in 1912," by C. E. Petch.
"Insects of the Season in Ontario," by L. Caesar.
"Injurious Insects in Quebec in 1912," by Prof. Lochhead.
"Forest Insects in Canada in 1912," by J. M. Swaine.
"The Elater Beetles," by G. Beaulieu.
'Aquatic Insects," by Dr. R. Matheson.
"The Entomological Record for 1912," by A. Gibson.
"Flea Beetles and Their Control," by A. Gibson.
"Insect Pests of Southern Manitoba During 1912," by N. Criddle.
"Some New and Unrecorded Ontario Fruit Pests," by L. Caesar.
"Arsenite of Zinc as a Substitute for Arsenate of Lead," by L. Caesar.

The Canadian Entomologist, the publication of the Society, under the editorship of Dr. E. M. Walker, has now entered its forty-fifth volume, and is recognized as one of the most valuable Entomological Magazines on the continent.

The Society is now entering upon its fiftieth year of existence, and will hold its Jubilee at Guelph at the end of August. Invitations have been issued to the Scientific Societies of America to send delegates to the meeting. It is noteworthy that one of the founders of the Society, Rev. Dr. Bethune, is President for the present year, and will preside over the meetings at the Jubilee Celebration.

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GREETINGS FROM SURVIVING ORIGINAL MEMBERS.

WM. SAUNDERS, LL.D., the first Secretary-Treasurer of the Entomological Society of Ontario, and for a number of years its President, sent cordial greetings to the officers and members by his son, on the occasion of the jubilee of the Society. Dr. Saunders' health was too frail to permit him to attend the gathering.

MR. EDMUND BAYNES REED, another surviving charter member, also sent a message from his present home in Victoria, B.C. Among other things he said: "I have a vivid recollection of the organization of our society and our first meeting at the residence of Professor Croft, and I have many pleasant memories of long years of friendly intercourse with many of my brethren of the Net. It seems hard to realize that only three of us remain of our original Charter number, but amidst all our feelings of sincere regret for the many absent friends and members who have "crossed the bar" there are bright and cheering thoughts of the splendid work carried on with their assistance so perseveringly for many years, which has helped to place our Society so deservedly in the forefront of this our chosen branch of Natural History. I especially bear in mind our valuable Library, in which I have always taken the deepest interest from its earliest days, when it began with some half dozen books lent by myself."

MR. N. H. COWDRY, who was one of the earliest members of the Society, writing from Chicago, Ill., said: "It is hard for me to realize that fifty years have passed since the first meeting. I was then fourteen years old, and can well remember some meetings which were held in a room opposite what is now the Assistant Receiver General's office in Toronto, and also some at the residences of Professors Croft and Hincks and Dr. Sangster. Some field days also interested me very much."

THE ROYAL SOCIETY OF CANADA.

The Royal Society of Canada takes a particular pleasure in extending to the President, officers and members of the Entomological Society of Ontario its felicitations on the occasion of your fiftieth annual meeting. As one of its affiliated societies, the Royal Society is mindful of the progress and invaluable work of your society whose field of labor is co-extensive with its own. The inclusion in its fellowship, however, of so many Canadian entomologists who have gained distinction through their advancement of the science, strengthens the bond which exists between the two societies. We would remind you that one of your founders, Dr. Wm. Saunders, C.M.G., is not only a charter member of the Royal Society also, but held with distinction the office of President of the Royal Society in 1906-7. Your Jubilee President, the Rev. Charles J. S. Bethune, M.A., D.C.L., and another of the founders of your society, has for many years been a Fellow of the Royal Society of Canada. The late Dr. James Fletcher, LL.D., twice your President, filled the office of Honorary Secretary of the Royal Society and worked for its welfare with that characteristic devotion which is known so well to your Society and which advanced your science in Canada to a degree not previously attained. As a Fellow of our Society we also deplored the death of the Rev. G. W. Taylor, whose studies in the Geometridæ gained him a continental reputation, and another of our Fellows, Mr. W. H. Harrington, added consider-

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ably to our knowledge of the Hymenoptera. In view of the enormous advances which have been made in Entomology during the last few years, especially in so far as the study of insects is related to the progress of agriculture and the prevention of human and other diseases the Royal Society feels assured that your work cannot be otherwise than of inestimable value to the people of Canada and to the advancement of knowledge. As a joint labourer in a field of unequalled opportunities, it desires to express to you its sincere wish for the continuance in even greater measure of that success which has so conspicuously attended your efforts in the past and for the progress of your science which has so intimate a bearing on the prosperity of this country.

FRANK D. ADAMS, D.Sc., F.R.S., *President.*

DUNCAN C. SCOTT, F.R.C.S., *Honorary Secretary.*

ADDRESSES BY DELEGATES.

Brief addresses, referring to the Jubilee of the Society, were given by a number of persons representing certain bodies or institutions, as follows:

REV. PROF. C. J. S. BETHUNE: I have been appointed by its President, Dr. Philip P. Calvert, to represent the American Entomological Society on this occasion, having been elected a corresponding member as far back as October 16, 1862. I have also the honour to be President this year of the Entomological Society of America, a much younger organization, which will be represented by its Secretary, Prof. MacGillivray, of Urbana, Ill.

The American Entomological Society of Philadelphia is one that claims precedence over our Ontario Society, having been organized in the year 1859, four years before ours came into existence. It began, as we did and many other institutions that have grown and prospered, in a very humble way. Three men, who were students of insects, met at the house of Mr. Ezra T. Cresson, one of the three in Philadelphia, on the 14th of February, 1859, and decided to form a Society for the advancement of Entomological Science. After talking the matter over, they arranged to invite all their acquaintances who were interested in the study, to attend a meeting during the following week and at the same house. On February 22, 1859, fifteen persons were present at the meeting and the organization was formed and named "The Entomological Society of Philadelphia." For some time their numbers were small, their finances very meagre and their meetings were held in private houses, but they were full of energy and enthusiasm. Soon the want of some means of publishing the papers and observations of members was felt, and a subscription was taken up to purchase a printing press and type. A small outfit was secured at a cost of $74.50, and the members after business hours worked hard and late in setting up type and striking off copies with the small hand press, which would only serve for one page at a time. Thus was begun the publication of the "Proceedings of the Entomological Society of Philadelphia" in March, 1861. A larger press and printing equipment were soon found to be necessary, but until January, 1885, the work continued to be done by volunteer amateurs. It is remarkable how well they did their work and how few are the errors to be

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found in those pages. Six volumes of these "Proceedings" were published, but are now out of print and a complete set will find a ready purchaser at a price of $50, so valuable is the work considered.

By 1867 the membership of the Society and the scope of its work had extended over the continent; it was therefore decided to change its name to "The American Entomological Society" and to issue its publications under the title of "Transactions" instead of "Proceedings." Thirty-nine volumes of the new series have now been published, appearing in quarterly numbers. They are a perfect mine of information on insects of all orders and are of so high a scientific character that no systematic worker can get on without them.

On behalf of this great and flourishing Society and by request of its President I have great pleasure in tendering to the Entomological Society of Ontario its hearty congratulations on the celebration of its Jubilee, and its best wishes for the continued success and prosperity of its Canadian co-worker in the vast field of Entomology.

PROF. E. M. WALKER: I have the honour of extending to you the greetings and congratulations of the University of Toronto on the occasion of the fiftieth anniversary of the Society's foundation.

Although Entomology has never been a prominent subject on the University curriculum this deficiency must not be taken as indicative of an underestimation of its value as a study or its importance to the community, for the Biological Department is highly appreciative of the importance and usefulness of the work that is being done by the Entomological Society of Ontario. The small place given to Entomology on the curriculum is due partly to the fact that as yet there is no faculty of agriculture in the University and partly because the elective system of instruction is not followed in our University, and it is, therefore, very difficult to provide for the teaching of special branches of zoology, such as entomology. The curriculum in biology is already almost overloaded with the more fundamental subjects.

The need of some knowledge of systematic zoology, particularly in entomology, is, however, keenly felt by many of our graduates who become science teachers in the high schools and collegiate institutes, and we are now offering a course in this subject which, it is hoped, will meet this need to some extent. It is hoped also that more of our graduates in biology may thus be stimulated to take a closer interest in entomology and the Entomological Society of Ontario.

The University of Toronto extends it best wishes for the continued growth and prosperity of the Entomological Society of Ontario.

PROF. W. LOCHHEAD offered the felicitations of McGill University, Montreal, and referred to the strong men who had been leaders in the work of the Society.

DR. C. GORDON HEWITT: I have been requested by the Minister of Agriculture, the Hon. Martin Burrell to represent the Department of Agriculture and to convey to the Society his hearty congratulations on this occasion. As many of you know, he takes a personal interest in entomology, especially in its economic aspects. In referring to the entomological work in the Canadian Department of Agriculture, I should like to say under what a great obligation we are to Dr. Bethune for the supply of men he has been able to give us. If it were not for the Ontario Agricultural College and the splendid training which is given to stu-

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dents who specialize in Entomology we could not have made such progress as we have been able to make. Their work speaks well for the excellent training they have received from Dr. Bethune.

MR. J. C. CHAPAIS, representing the Quebec Society for the Protection of Plants, after offering congratulations, spoke of the splendid work done for entomology in the Province by the late Abbé Provancher, and by Rev. Thos. Fyles.

MR. R. C. TREHERNE conveyed the compliments and the good wishes of the British Columbia Entomological Society and more especially to the honored President, Dr. C. J. S. Bethune, from whom they had always received sound advice and encouragement.

MR. H. H. LYMAN, in the absence of Mr. A. F. Winn, presented the felicitations of the Montreal Branch of the Entomological Society of Ontario. He referred to the celebration, fifteen years ago, of the 25th Anniversary of the Branch, which has the honour of being the third senior entomological society on this continent, being antedated only by the American Entomological Society and the parent society. He extended warm congratulations to the revered president, Dr. Bethune, and expressed the hope that he might long be spared to the society.

DR. A. COSENS very cordially extended the greeting of the Toronto branch of the Entomological Society of Ontario.

MR. ARTHUR GIBSON, representing the Ottawa Field-Naturalists' Club, offered warm congratulations. The Club desired to place on record its full appreciation of the splendid results achieved by the Entomological Society of Ontario during the fifty years of its existence. The series of volumes of the Canadian Entomologist and the yearly reports of the Society are invaluable to students of insects of every country.

PROF. COMSTOCK extended the heartiest congratulations of the Entomological Society of London.

PROF. P. J. PARROTT said: In representing the American Association of Economic Entomologists it gives me great pleasure to present greetings to the Entomological Society of Ontario at this celebration of its fiftieth anniversary and to express our heartiest congratulations upon the completion of this period of honorable and effective service, and to extend warm wishes for continued success and prosperity.

F. M. WEBSTER, representative of the Entomological Society of Washington and the Bureau of Entomology, U.S. Department of Agriculture, brought greetings from these. He spoke with feeling of the high character and ability of the late Dr. James Fletcher, and referred to the excellent work done by Dr. Saunders and Dr. Bethune. He also said that they had a number of graduates from Guelph in the Bureau, and "if we have a poor one, I certainly do not know it."

PROF. J. H. COMSTOCK, representing Cornell University, said: Your colleagues in the study of Entomology at Cornell University wish to extend to you our heartiest congratulations on your completion of fifty years of most eminent service to our favorite science.

The unselfish devotion of the members of this society to science has been an inspiration to all American entomologists. The appearance of your journal, *The Canadian Entomologist,* has been eagerly looked for monthly by many readers across the border. In fact this journal has been Canadian only in name, for the generous treatment of contributors living south of the Great Lakes has made us feel that it is our journal also, and those of us who have been admitted to membership in the Entomological Society of Ontario appreciate the honour most deeply.

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DR. E. P. FELT, representing the New York Entomological Society, briefly said: The New York Entomological Society, through its accredited representatives, hereby conveys to the Entomological Society of Ontario its most hearty felicitations upon this Jubilee occasion. We would also extend to your highly respected and beloved President a most sincere appreciation of the part he has taken in establishing the Society and putting entomological work in Canada upon such a satisfactory basis.

MR. GEOFFREY MEADE-WALDO, representing the British Museum Natural History Department, brought most hearty congratulations from the President of the British Museum to the Entomological Society of Ontario on the accomplishment of fifty years of such splendid work, with all best wishes for future prosperity.

DR. R. STEWART MACDOUGALL, representing the University of Edinburgh, Scotland, and the Imperial Bureau of Entomology, was hearty and sympathetic in his congratulations. He also remarked that the Entomological Society of Ontario was celebrating its jubilee at a time when more than ever before an interest was being taken in economic entomology.

DR. C. GORDON HEWITT represented the University of Manchester, England, and on behalf of that institution presented greetings and sincere wishes for continued success. He also extended congratulations as representing the Academy of Science, of Philadelphia.

MR. J. D. TOTHILL conveyed the hearty congratulations of the Natural History Society of New Brunswick which, only a few months ago, had celebrated its own 50th anniversary. As a proof of the Society's interest in entomology he mentioned that it had embarked upon the preparation of a list of New Brunswick insects, somewhat after the plan of the late Dr. J. B. Smith's "Insects of New Jersey."

LETTERS OF CONGRATULATION.

Letters from a number of representative bodies, all of them encouraging and most of them couched in most felicitous terms, were received, and read. Unfortunately there is room in this report only for their bare acknowledgment, as follows:

Laval University, Quebec.
University of Cambridge.
University of Oxford.
Natural History Society of Glasgow.
Boston Society of Natural History.
California State Commission of Horticulture.
University of Chicago.
University of Colorado.
The Essex Institute, Salem, Mass.
Harvard University.
University of Iowa.
Kansas State Agricultural College.
Leland Stanford Junior University.
German Entomological Museum.
Imperial Academy of Sciences, St. Petersburg, Russia.

Letters of a congratulatory nature were also received from a number of individual well wishers.

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PRESIDENTIAL ADDRESS.

Rev. Prof. C. J. S. Bethune, O.A.C., Guelph.

For nearly a year now I have been unable to write, and for a longer period unable to read without considerable difficulty; you can, therefore, understand that it has been quite impossible for me to prepare a formal address to present on this occasion. It has been suggested to me that it might interest those who are here to-day to tell you something about the formation of the Society, and also of the conditions under which we, who were young at that time, had to work, so different from those of the present day.

To tell you about these things involves speaking about myself, and I may be considered somewhat egotistical, but that is natural if one speaks of one's self. When I was a student at Trinity College, Toronto, a good while ago, I became very much interested in entomology. There were classes at the college in Elementary Physics, called then "Experimental Philosophy," in Chemistry and Geology, but there were no lectures in Biology. At that time meetings of the Canadian Institute were held on Saturday evenings through the winter months. I was enabled to join as a junior member and used to attend these meetings, which concluded with coffee and biscuits in a sociable way, and thus the members got to know each other. Though only a young man, I formed acquaintance with the professors at the Toronto University, with which Trinity College had nothing to do in those days. Dr. Croft, professor of Chemistry, and Prof. Hincks of Botany, were two with whom I became most intimate.

I was given access to the University Library, and found a good many old works on entomology. One day Prof. Croft said, "You ought to know young Saunders of London; he is a chemist but is much devoted to entomology, you should make his acquaintance." So I wrote to "young" Saunders, and that was the beginning of a friendship which has now lasted for over half a century. We began writing frequently, and subsequently visited each other, which led on to the formation of this Society. At that time he was a very slight and delicate young man, one would hardly think he could live for any length of time, and one could not imagine then that he would develop into the broad shouldered man he afterwards became. I think his improvement in strength was largely due to doing entomological work and spending all the time he possibly could out of doors. In those days he was a druggist and chemist, kept a drug store in London, and lived in rooms above, having a laboratory in the rear. Dr. Saunders was one of the most remarkable men I ever met through his capability for doing good work in so many different directions. He was an excellent botanist, and one of our foremost men in economic entomology. He was greatly interested in growing fruit, and knew all about the different varieties, having a fruit-farm on the outskirts of the city and being at times President of the Ontario Fruit-Growers' Association. He was also well known amongst pharmaceutical people, and was President of the American Society of that name. He was a member of the American Association for the Advancement of Science; one of the original Fellows of the Royal Society of Canada; Director of the Huron and Erie Savings Society, and interested in other business organizations. On Sundays he had a class of about seventy young children whom he used to instruct in a delightful manner. Finally, possessing all these accomplishments and attainments, he was chosen as Director of the Experimental Farms of the

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Dominion, and moved to Ottawa, and his work since has been widely known. He had to plan out the whole organization of the system and it has been wonderfully successful.

Now to get back to my early days. When I began collecting and studying insects there were no publications available. The first book that gave me any idea of Canadian insects was Gosse's "Canadian Naturalist." (Dr. Fyles mentioned this in his paper last year). It was in the form of conversations carried on between father and son describing all the natural phenomena that were to be observed during each month of the year. There were illustrations given of a few butterflies and beetles and the names of some of them, but the list was very meagre.

There was a printer in Toronto by the name of Couper, a man of no education to speak of, but who was devoted to entomology and nature in general. He published a series of papers in the *Canadian Journal*, giving brief descriptions of all the larger beetles to be found in the neighborhood of Toronto. This was an immense help to me and others who were interested in these insects. He also published a calendar, giving dates of appearance of birds and insects. In those days before Confederation, Canada consisted of the provinces known as Upper and Lower, now called Ontario and Quebec, and Parliament met in Toronto. It had a wonderful library for those early days, in which I was permitted to go and read, but not to take any books out; so I spent there any time I could, and copied out descriptions of insects and made drawings of illustrations. The descriptions were mostly in Latin or French. The Library had the early issues of the Journals of the Academy of Natural Sciences of Philadelphia and other Societies. It was thus no simple or easy matter to get any literature whatever on the subject of entomology. The greatest help I obtained was a copy of Westwood's Modern Classification of Insects, which at the time I procured it was an expensive book. From Kirby and Spence's Entomology I also learnt a great deal, though the third and fourth volumes which were more technical, I could not get access to until sometime later.

This, I hope, will give our younger members encouragement in carrying out this study. If we had had such works as Comstock's Manual and Mrs. Comstock's "How to Know the Butterflies," they would have been treasures indeed.

My acquaintance with Dr. Saunders led to our talking over matters from time to time, and we resolved to try and get entomologists in Canada acquainted with each other. By the aid of correspondence we got together the names of thirty-six people in Canada who took some interest in entomology. The list was published with addresses in the "Canadian Naturalist and Geologist," Volume VII, pages 199-201, Montreal, June, 1862. We thought the time had arrived to hold a meeting. We issued invitations to meet in Toronto at the residence of Prof. Croft, the autumn of 1862, but only ten were able to come. We discussed the question of forming a Society, but the matter was postponed until the following spring, because it was thought that the members present were too few to be considered representative. We then called another meeting which was held on the 16th of April, 1863, in the rooms of the Canadian Institute in Toronto. There were only twelve present, but we had letters from several others and so we decided to go on. A constitution was adopted and the society was named The Entomological Society of Canada. The members at that meeting were: Prof. Croft, D.C.L., who was elected President; the Rev. Prof. W. Hincks, F.L.S., who acted as Chairman; Dr. Sangster, Principal of the Normal School in Toronto and publisher of various school books that were in use throughout this Province, one in use for many years was called Sangster's Arithmetic. Mr. J. Hubbert, a Divinity student at Knox's College,

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Toronto, and who was our first Curator; Dr. Cowdry, an Englishman, who had come to Canada some years before, was present, and his son, Mr. N. H. Cowdry, whose letter has been read to-day, was with him. Dr. Saunders, of course, was there and was elected Secretary-Treasurer; Dr. Beverley R. Morris, who left Canada soon afterwards and returned to England where he became editor of a popular journal on natural history. Mr. E. Baynes Reed of London was unable to come to the meeting, but was at the previous one, and thus was one of the original members. This means that there are four of the original members still alive: Dr. Saunders, Mr. Baynes Reed, Mr. Cowdry, and myself. It is certainly somewhat remarkable that out of that small gathering there should be four still alive after a lapse of fifty years. I may mention that the week after this meeting I was married and went to England, and was absent from this country for a year and a half. During my visit to England I came to know Dr. Francis Walker of the British Museum, who was extremely kind to me, and other entomologists whose names are still well known.

On my return from England Dr. Saunders was elected President, and I was made Secretary-Treasurer of the Society, and held that office for some years. So matters went on until the year 1868. I was then living at Erindale, about 20 miles west of Toronto, and had charge of a country parish covering seventy square miles. My spare time I devoted to entomology. After much consultation I began the publication of *The Canadian Entomologist* magazine, which was to be the organ of the Society. The first number consisted of eight pages, and the prospectus stated that the periodical would be issued "not oftener than once a month," and only when sufficient material was supplied. The material has never failed, and it has been issued month by month for forty-five years.

We were very much encouraged in our venture by letters from friends in the United States. I remember particularly Mr. Samuel H. Scudder, of Cambridge, Mass., the author of a wonderful book on "Butterflies of the Eastern States and Canada" and other works, Hagen, Drs. Packard and Riley, and others of the old days. So we went on and the magazine grew in size and favour and gradually came to have a good circulation, and now there are subscribers in almost every civilized country in the world. The volumes have become of such importance to students that we are frequently asked for a complete series of the back volumes, and every now and then we send whole sets to different parts of the world. Sets have been sent to St. Petersburg, to Germany and California, and constant applications are received for single numbers. Anyone who makes a specialty in any department of entomology finds that he must consult some part or other of *The Canadian Entomologist.*

In the year 1870 we were asked to prepare a report on injurious insects. Dr. Saunders, Mr. Reed, and myself put our heads together, and we determined we would do our best to fulfil this requirement. The result was that the following year there was issued the first Annual Report of the Entomological Society of Ontario. There were three articles in all; mine was on insects affecting apple trees; Dr. Saunders wrote upon insects affecting the vine, and Mr. Reed on those attacking the plum. We tried to make these articles as exhaustive as possible, describing all the insects we knew that attacked these important fruits. The report was received with great favour, and was widely distributed by the Department of Agriculture. It was the beginning of a series that has now gone on for forty years. That first volume was considered so satisfactory that it was reprinted twenty-five years later.

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The effect of the publication of our first report was that the Department gave the Society an annual grant. The first was $400, but happily for us the Society's fortunes were made by the advent of the Colorado Potato Beetle. We had been noticing how this insect pest was working its way from the far west to the east. I had seen it on the shore of Lake Michigan at Chicago, and it had now reached Detroit, and was preparing to cross the St. Clair River to Ontario. The danger was brought to the notice of the public through the agricultural and other papers, and we were asked to investigate and draw up a report. Dr. Saunders and Mr. Reed took the matter up, but by that time the beetle had established itself on our frontier. They tried various experiments. Dr. Saunders, being a practical chemist, understood the use of arsenicals, and found Paris green to be a very effective killing agent. The report they made was a very good one, and it was published in one of our annual reports as well as separately. The result was that our annual grant was increased to $1,000, and has been continued ever since. This much we owe to the Colorado Potato Beetle!

For nine years the Canadian Institute in Toronto gave the Society the privilege of using its library and museum for its meetings and collections. Meanwhile a flourishing branch of the Society grew and developed in London, and in 1872 it was decided to remove the headquarters to that city and rent rooms for the accommodation of its books and collections. There it remained for no less than thirty-four years, and in 1906 a removal was made to the Ontario Agricultural College, Guelph.

The history of the Society since those early days may be found recorded in our chronicles—*The Canadian Entomologist* and the Annual Reports.

Now I am reminded that I must bring these reminiscences to a close. Before doing so I wish to express the great pleasure it has given my colleagues and myself that so many friends have come from long distances to join in the celebration of the Jubilee meeting of the Society. We give you all a most hearty welcome and hope that you will fully enjoy your visit.

LIST OF ENTOMOLOGISTS IN CANADA IN THE YEAR 1862.

FROM THE CANADIAN NATURALIST AND GEOLOGIST, VOLUME 7—pp. 199-201, PREPARED BY C. J. S. BETHUNE AND WM. SAUNDERS.

Beadle, D. W., St. Catharines, C. W., Coleoptera and Lepidoptera.

Bell, R., Provincial Geological Survey, Montreal. All orders, but specially Coleoptera and Lepidoptera.

Bethune, Rev. Charles, J. S., B.A., Cobourg, C. W., Coleoptera and Lepidoptera.

Billings, B., Prescott, C. W., Coleoptera, Lepidoptera and Orthoptera.

Billings, E., F.G.S., Provincial Geological Survey, Montreal. Coleoptera and Lepidoptera.

Bush, Geo., Coldwater, County of Simcoe, C. W., Insects of all orders; collects also for sale.

Clementi, Rev. Vincent, B.A., Peterboro', C. W., Coleoptera and Lepidoptera.

Cottle, Thomas, Woodstock, C. W., Lepidoptera.

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Couper, William, National Bank Building, John Street, Quebec. "Entered the entomological fields of Canada in 1843, and still continues his researches. Collects all the orders, and studies the geographical distribution of Coleoptera."

Cowdry, Thomas, M.D., York Mills, County of York, C. W., all orders.

Cowdry, N. Harrington, York Mills, C. W.

Croft, Prof. Henry, D.C.L., University College, Toronto. Collects all orders, but more especially Hymenoptera and Coleoptera. His collection of Coleoptera is the finest in the Province.

Crooks, Miss Kate, Hamilton, C. W.

Cummings, Willoughby, Chippawa, C. W., Coleoptera and Lepidoptera.

Denton, J. M., Dundas Street, London, C. W., Lepidoptera and Coleoptera.

Devine, Thomas, Crown Lands Department, Quebec.

Dewar, Miss, London, C. W., Coleoptera and Lepidoptera.

Edwards, W., Port Stanley, C. W., Coleoptera and Lepidoptera.

Gibbon, Miss, St. Mary's, C. W., Lepidoptera.

Girdwood, G. P., Asst. Surgeon, Grenadier Guards, Montreal.

Girdwood, Mrs. G. P., Montreal.

Grant, Francis, Orillia, C. W., Coleoptera and Lepidoptera.

Hill, Rev. Geo. S. J., M.A., Markham, County of York, C. W., Coleoptera and Diptera.

Hincks, Rev. William, F.L.S., Prof. of Nat. Hist., University College, Toronto. Studies all orders, but does not collect.

Hubbert, James, Knox College, Toronto, and (during vacations) Grafton, County of Northumberland, C. W., Diptera, Neuroptera, and, to some extent, Coleoptera.

Kreighoff, C., Quebec. Insects of all orders; pays particular attention to Lepidoptera (Heterocera) and Coleoptera.

Lawford, J. M., Toronto, Lepidoptera and Coleoptera.

Lawrason, W. L., Dundas Street, London, C. W., Lepidoptera and Coleoptera.

Morris, Beverley R., M.D. Institution for the Deaf and Dumb, and the Blind, 490 Queen Street, Toronto. All orders, but chiefly Coleoptera and Lepidoptera.

Provancher, Rev. L., St. Joachim, Montmorency, C. E. All orders, except Aptera; pays special attention to Lepidoptera and Coleoptera.

Reed, E. Baynes, London, C. W., Coleoptera and Lepidoptera.

Reynolds, T., Financial Director, Great Western Railway, Hamilton, C. W., Lepidoptera.

Rooke, Capt. W. S., Scots Fusilier Guards, Montreal. Coleoptera and Diurnal Lepidoptera.

Saunders, William, Dundas Street, London, C. W. All orders, chiefly Coleoptera and Lepidoptera.

Turton, F., Simcoe Street, London, C. W. All orders, chiefly Coleoptera and Lepidoptera.

Rogers, Robt. V., Jr., St. James' Parsonage, Kingston, C. W.

AN ENTOMOLOGICAL PICNIC.

Rev. Prof. C. J. S. Bethune, Guelph.

The first Entomological picnic held in Canada took place on the 8th of July, 1868. The annual general meeting of the Entomological Society was held by invitation of the London Branch in their rooms in the City Hall, London, on Tuesday, the 7th of July. The next day "the members met at 8.30 a.m. and drove a few miles into the country for an Entomological field day and picnic. On arrival at the selected place, all betook themselves to the woods, fields and river side and spent a few hours in the capture of insects of various orders. Many rare and inter-

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esting specimens were taken and fair success was obtained by all. At midday they reassembled for lunch, which was kindly provided by the London members, and after it had been duly discussed and enjoyed, another sally was made upon the insects in the neighborhood until the time of departure arrived. A photograph of the members of the group was taken by Mr. Griffiths as a memento of this first pleasant gathering of the Society under its new constitution."—(*The Canadian Entomologist*, Volume I., No. 1, Page 8, August, 1868). In the accompanying photograph may be seen sitting upright on the fence, Mr. Wm. Osler, now Sir Wm. Osler, Baronet, Regius Professor of Medicine at the University of Oxford. Reclining on the fence is Mr. Edmund Baynes Reed, one of the original and most active members of the

Entomological Picnic at London, Ont., July 8, 1868.

Society. He is now in charge of the Meteorological Station at Victoria, British Columbia. Reading from left to right, the boy was Mr. Symonds, afterwards a druggist in London; second C. Chapman, bookbinder, London; third, Mr. J. M. Denton, for many years a very active member; 4th, the Rev. C. J. S. Bethune; 5th, Wm. Saunders, and, standing in front of him, his son, W. E. Saunders, now well known as one of the best ornithologists in Ontario; 6th, Dr. Sangster; 7th, his son; 8th, Professor Croft, first President of the Society; 9th, the Rev. R. H. Starr. Sitting on the ground are Mr. J. Watterman and Mr. C. Symonds. Several of those represented were not greatly interested in entomology, and after some few years ceased to be connected with the Society. This is the only photograph of Professor Croft that is possessed by the Society, and is therefore of considerable interest.

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GREEN LANES AND BYWAYS.

Rev. Thos. W. Fyles, D.C.L., Ottawa.

Old Country Lanes.

I

"Through the green lanes of England, a long summer day,
When we wandered at will in our youth's merry May;
When we gathered the blooms o'er the hedge-rows that hung,
Or mocked the sweet song that the nightingale sung.

"In the autumn we knew where the blackberries grew,
And the shy hazel-nuts hidden deep in the shade;
And with shouting and cheer, when the Christmas drew near,
In search of the ripe, ruddy holly we stray'd."

These lines appeared in the "Illustrated London News" for January the 24th, 1852. They are dear to my remembrance, for they were sung to me by a much-loved companion—long gone to his rest—as we strolled along an English lane, one day in the summer, after their appearance. From this friend* I received my first lessons in Entomology.

The enclosures in the rural parts of England, by which the road-ways pass, have been from times immemorial, and for the most part they are known each by its proper name, as "Nether lea," "Ea-side," "Haly-well Croft," "Twenty acres," "Basket lot," etc. The boundaries of the fields are quickset hedges, with ditches on the outer sides. Six feet from the roots of a hedge was allowed for the ditch.

The original growth of the hedges was Hawthorn (*Cretægus oxycantha* L.), but, as time passed on, birds and other agents dropped seeds of many plants among the thorns. The most noteworthy of the intruding growths are: Blackthorn (*Prunus spinosa*), Dog-rose (*Rosa canina*), Honeysuckle (*Caprifolium perfoliatum*), Holly (*Ilex aquifolium*), Traveller's Joy (*Clematis vitalba*), Elder (*Sambucus nigra*) and Bindweed (*Convolvulus sepium*).

The mud from the ditches—washings from the roads and fields—is thrown up periodically to the hedge-bottoms, and the fresh soil maintains the varied growth in constant vigor.

Some of the byroads of England were formerly important highways. In a tour I made, in my youth, to Tennyson's country in North Lincolnshire, I came one day to a little place that, I was told by a countryman, was "Spittle-in-the-Street." After a little thought I understood the name. "Spittle" was *'Spital*, a contraction of *Hospital*, and the "Street" stood for the *Stratum*, the Roman way from Lincoln (*Lindum Colonia*— the *Colony-in-the-Marsh*) to the Humber. Yes, along that way, centuries ago, marched the legionaries of the Cæsars, in stern array, while the woad-stained Coritani peeped out upon them from their coverts, in hatred and fear.

In after and pre-reformation days, a religious house of entertainment for travellers was erected beside the ancient road, and this was the Hospital-in-the-Street. There remained of it a farmhouse and the chapel. In the latter a clergyman from a neighbouring parish held services at stated intervals.

*Mr. Edwin Tearle, in after years Rector of Stocton, in the Diocese of Norwich.

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In some parts of England where the country is of rolling surface, and the soil light—the lanes being frequently cut up by heavy farm waggons, and but little cared for—the soil is constantly washed by the rains to lower levels, and hollow ways are formed, such as those spoken of by Kirke White in one of his sonnets:

> "God help thee, traveller, on thy journey far,
> The wind is bitter keen, the snow o'erlays
> The hidden pits and dangerous hollow ways,
> And darkness will involve thee."

In that powerful description of the Battle of Waterloo, given by Victor Hugo in *Les Miserables,* we are told of a grand charge made by three thousand five hundred French cuirassiers upon the English centre. At full speed, in the fury of the charge, the warriors came to the hollow way of Ohain, twelve feet deep, of which they were unaware. Unable to check their steeds, they plunged in, one upon another, and piled up—a writhing mass, crushed and broken. "One-third of Dubois' brigade"—says Hugo—"fell into that abyss." "This," he says, "began the loss of the battle."

But let us quit the contemplation of disasters and consider the delights of English lanes. And, truly, those lanes are delightful—with their hedgerows gay with blossoms, diffusing sweet perfumes and jubilant with the song of birds!

English hedges are famous nesting-places for many of the feathered tribes. I can recall the pleasure of my first inspection of the nest of the Long-Tailed Tit (*Parus caudatus*). It was a seemingly compact ball of the finest and greenest moss; but it had on one side a small round entrance, closed with a feather. The Tit lays many tiny white eggs, spotted with lilac.

Another nest that attracted my attention in my early days was that of the Red-backed Shrike (*Lanius collurio* L). The mother bird was sitting on her pretty, cream-coloured, richly spotted eggs. Meanwhile her mate was busy attending to her wants. He kept her larder well supplied. On the thorns around her were impaled little blind mice and callow birds, shewing that the common name of *Butcher-bird* was justly given to this feathered pillager. But—as an Eastern Township housewife said in praise of her husband, so we may say of the Shrike—"He is a good provider."

It is said* that the English ornithologist, Gould, dated his interest in bird life from the time when, in his childhood, he was lifted up to see the pretty blue eggs in a hedge-sparrow's nest.

Here and there, in the South of England, a lane leaves the enclosures and traverses a piece of common land covered with bushes of the Furze (*Ulex europæus*). This strange plant, which has spines instead of leaves, is, in its season, gorgeous in its wealth of golden bloom. Linnæus, on first beholding it upon Wandsworth Common, fell upon his knees and thanked God who had created a thing so beautiful.

Elsewhere the lane enters, it may be, a stretch of woodland, the game preserve of the lord of the surrounding Manor; and there, truly, the wayfarer is in the midst of charming sights and sounds. In early spring the woods around him are ankle-deep with blue-bells, anemones and primroses. Later in the year the stately foxglove (*Digitalis purpurea* L.) rears its shafts of purple bloom, and "lords and ladies" look out from their stalls.

*"Country Walks of a Naturalist with His Children," p. 109.

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Many beautiful butterflies sport around. I can mention but a few of them. The pretty Speckled Wood (*Lasiommata ægeria*) is everywhere in evidence. The lovely Peacock (*Vanessa io*) and the Brimstone (*Gonepteryx rhamni*) show well against the surrounding foliage. The Silver-washed Fritillary (*Argynnis paphia*) flits over the brambles, on which its larvæ feed. Once in an age a Queen of Spain Fritillary (*Argynnis lathonia*) makes its appearance—blown over, it may be, from France. The Bath White (*Pieris daplidice*) sometimes shows itself, and formerly the Black Veined White (*Aporia cratægi*) could often be seen.

Years ago, in such a wood, I saw what English entomologists seldom see—a specimen of the Camberwell Beauty (*Vanessa antiopa*). It came sailing over the tree-tops and lit upon an oak sapling immediately before me, and then opened its lovely wings. A moment— and it was gone! And I saw it again no more.

Where oak trees are plentiful in the forest, the monarch of English butterflies, the stately Purple Emperor, may sometimes be seen, and there the Purple Hairstreak will surely be found.

Remarkable instances of insect mimicry will engage the attention in such a wood. Here by the road-side is a bush of Broom—the *Planta genista* of olden times, from which the great Plantagenets of English History derived their surname:

> "That name Count Geoffrey did assume
> When, riding to the chase,
> He wore in his casque, instead of plume,
> A nodding crest of the yellow Broom,
> In its fresh and fragrant grace."

As the traveller approaches the shrub, he will be surprised to see a number of supposed *leaves* of the plant detach themselves from the twigs and flutter away. They are specimens of the tiny Green Hairstreak (*Thecla rubi*).

At another time, noticing the long cylindrical catkins of the birch, he will be astonished to see that which he had taken to be one of them move away with alternate loops and strides. It is a larva of the Large Emerald Moth (*Geometra papilionaria* L.).

In the woodland lane the ear is—"charmed with concord of sweet sounds." Suppose yourselves in such a lane—call to your imagination its sights and sounds,

> Let us recline beneath this tree,
> So ragged with lichens—ragged and gray;
> Its fretwork of leaves shall our canopy be,
> Our carpet the moss where the sunbeams play.
>
> And we'll list to the pipes of the robin and wren,
> To the flute of the merle so loud and clear,
> To the trumpet call of the cuckoo, and, then,
> To the deep bassoon of the stock-dove near.
>
> See you the black-cap 'mid the leaves;
> With his glad song his bosom heaves;
> His efforts rouse to rivalry
> The pride of all Pan's company
>
> Of choristers, sweet Philomel,
> And now soft cadence and rich swell,
> And hurried note and note prolonged,
> Echo the glades and thickets through;
> As oft, when Sol is borne from view,
> In his car of crimson clouds they do,
> Till heaven with listening stars is thronged.

—T. W. F.

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The linnet, the goldfinch, the bullfinch, the greenfinch, the whitethroat, the yellowhammer, the thrush, the misselthrush, and other birds, do their best to render the concert of the feathered tribes effective.

Here and there in the road-side hedges a crab-tree may be seen, and here and there a holly.

The holly is sometimes grown as an ornamental hedge. John Evelyn had such a hedge, and he tells how the Czar of Muscovy (Peter the Great) and his outlandish crew amused themselves by trundling one another in a wheel-barrow, backwards and forwards through the prickly barrier. Evelyn had lent his house and grounds for the accommodation of the Muscovites. When the foreigners retired, they left a *muss* behind them.

II.

Canadian Lanes.

Doubtless, in olden times, when men were few and land grants under the feudal system extensive, hedging and ditching were ready means for enclosing and draining the land, and they have been enduring means.

In Canada the roads that remind one of English lanes, though in truth they are very different, are such as lead through parts of the country in which the old-fashioned snake-fences still enclose the farms and in which brush has been allowed to grow freely in the angles of the fences. In such localities, old roads abandoned for new ones, concession roads leading to a few homesteads off the main lines of travel, roads through sugar-woods and the uncleared forest—these, in their quietude and freedom from dust, are suggestive of English lanes—though they lack much of their beauty.

I will speak briefly of a few such roads:

The Caledonia Road.—Skirting a tract well known to the naturalists of Ottawa, by the name of "The Beaver Meadow," is a lane connecting the Aylmer Road with the Chelsea Road. It was originally a "Corduroy road," and it still ends in the remains of a swamp, in which *Typha latifolia* grows freely. Improvements in the neighbourhood have altered its appearance: the logs are gone, and the bed-rock is seen in much of its length; and this, in summer, is carpeted with Stonecrop (*Sedum acre* L.)

Alas! the Beaver Meadow has now been cleared, drained and laid out into building lots. The city naturalists will have to go farther afield for their investigations, and the Caledonia Road will soon become a city street. When I lived in Hull, however, I spent many tranquil hours within its quiet limits.

Muddy spots in the road were much frequented by butterflies. In bright days in April hibernated specimens of *Aglais milberti* Godart might be seen there. The spring larvæ of this species may be found feeding upon the young shoots of the Stinging Nettle (*Urtica dioica* L.). I raised two batches of them in 1911. They went into chrysalis in the first week of June. Sixty per cent. of them were parasitised by *Protopanteles atalantæ* Packard. The grubs of this fly issued from the larvæ of the butterfly—not through the spiny upper parts, but—through the tender ventral portions. They spun their white, compact cocoons in clusters attached to the skins of their victims. The first imagos of *milberti* appeared in my breeding-cage on the 13th of June.

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The large Skipper (*Eudamus tityrus* Fab.) might be seen on the Caledonia Road. I had become acquainted with this insect on Mount Royal, where its larvæ fed on the Hog-peanut (*Amphicarpæa monoica* Nutt.), but there I had seen it in its short flights only, as it skipped from bush to bush. When then I witnessed its rapid flight through the open for the first time, I was puzzled. Its direct course; the peculiar motion of its wings; the flashes, in the sunshine, of the large, heart-shaped, silvery patches on the under side of the hind wings—all were new to me. I had to catch the insect to make sure of its identity. In the neighbourhood of Hull its larvæ feed on *Robinia pseudacacia* L. It gathers several leaflets of the tree together, binds them, and feeds under their cover.

A stream, the outlet of Fairy Lake, crossed the Caledonia Road, and over it a rude wooden bridge was thrown. At this point the Turtle-head (*Chelone glabra* L.), the Vervain (*Verbena verticillata* H. B. K.), the lovely Swamp Loosestrife (*Decodon verticillata* H. B. K.) and the Joe Pie Weed (*Eupatorium purpureum* L.) grew in a tangle. On the last named the larvæ of the handsome Tiger Moth (*Arctia caja* L.) fed.

Ought not this specific name to be written and pronounced *Caia?* Linnæus, in naming it, probably had in mind the form of words spoken by the bride in the marriage ceremonies of the ancients: "*Ubi tu Caius, ibi ego Caia.*" We have an instance of the use of the long i, or j, in the last of the numerals representing *four* —iiij. *Halleluiah* was spelt with a j in former times; and I once knew a worthy clergyman whose name was Micaiah, but who always spelt it *Micajah*, with a thought, I doubt not, of the sacred name in the 68th Psalm.*

On the growth spoken of above the pretty Neuropteron *Chauliodes serricornis* Say was often to be seen.

Along the Caledonia Road locusts were numerous. In 1909, particularly, our largest species, *Dissosteira carolina* L., abounded. But a natural check to its undue increase came; many of the insects were affected by *Entomophthora grylli*, and the species has not been so plentiful since.

Levis Military Road.—A by-way of interest to naturalists is the road connecting the Forts on Levis Heights. The ramparts raised for the defence of this road are now overgrown with brush, and bushes and young trees have sprung up on both sides of it. In the scrub the tall *Diplopappus umbellatus* (Miller) grows abundantly, and upon this the galls of *Gnoremoschema gallædiplopappi* Fyles may be found.

What a formidable name "Gnoremoschema" is! It was derived, I suppose, from the Greek, Gnorimos—well known, and Cheima—in winter. The insects that cause the galls, however, do not occupy them in winter. Having escaped their enemies and come to perfection, they quit their dwellings in August, or September at the latest.

But in some instances the galls are not without winter tenants, several kinds of Ichneumon flies, having preyed upon the former inhabitants, spin their cocoons within the galls and remain in them till summer comes around.

The young gregarious larvæ of that lovely butterfly *Melitæa harrisii* Scudder may be found, late in the season, in dingy, closely clinging webs, on the stalks of the Diplopappus. In the spring they disperse and thrive rapidly on the young shoots of the plant.

*Praise Him in His name Jah and rejoice before Him. Psalm lxviii: 4.

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In this locality the Large-leaved Aster (*Aster macrophyllus* L.) grows plentifully. An insect of remarkable habits feeds upon it, viz., *Tricotaphe levisella* Fyles. The larvæ of this species fasten the edges of the large bottom leaves together and thus form ample tents within which they feed. A full description of the insect in its different stages is given in the 33rd Annual Report of our Society on page 28.

Another insect deserving of notice that may be met with along this military road is the fine ruby-winged locust described by Harris under the name *Locusta corallina* (See "Insects Injurious to Vegetation." p. 176).

Old St. Henry Road.—This road, when I lived at South Quebec, was a rich hunting ground for the naturalist. No less than eight species of the Cicindelidæ frequented it, viz., *longilabris, 6-guttata, limbalis, purpurea, vulgaris, 12-guttata, repanda* and *hirticollis.*

I took *Lexis bicolor* Grote on this road. *Thecla titus* Fabr. was plentiful there, and *Debis portlandia* Fabr., *Phyciodes nycteis* Dbl. and *Pamphila paniscus* Fabr. were there to be seen.

Where the road passed through damp woods, a plant that attracted attention was the White Lettuce (*Nabalus altissimus* Hooker). Its stout stems rose like spires, from the wayside, tall as a man, and clothed with long leaves. This plant is a habitation and food-store for *Aulax nabali* Brodie. By slitting its stalks late in the season, the cells or cocoons of the species may be found. The imagos bite their ways of exit from their hibernacula in March.

Eastern Township Lanes.—There are lanes and by-ways in the Eastern Townships that more nearly resemble the green lanes of England than those I have spoken of, and interesting objects appear in them. Riding slowly through one such lane in the year 1867, I witnessed a sight which I had never seen before, and which I do not expect to see again, namely— a small flight of Passenger Pigeons (*Ectopistes migratorius*). There were seven or eight of them. They lit on some second growth maples a few yards in advance of me. They flapped their wings, and flirted their long tails, and preened their fine plumage, greatly to my delight.

Two other kinds of birds especially worthy of notice that came under my observation in the Eastern Townships' lanes were the Great Grey Owl (*Scotiaspex nebulosa*) and the Barred Owl (*Strix varia*). The former whose big round head seemed too large for his body was greatly disturbed at my appearance. It rolled its head and fidgeted and blinked at me, but seemed to doubt the propriety of taking flight—it may have been recently mobbed by other birds. I left it unmolested to its wise cogitations.

The Barred Owl is a smaller bird—trim and alert.

Green lanes in those parts are frequented by the strangely elusive and tantalizing butterfly *Grapta j-album,* Boisd. & LeC. It is an insect of rich colouring and powerful wing. It rises before you, and you watch its direct and rapid flight, and note the spot where it alights. You hasten thither, and, drawing nigh, walk warily; but, look carefully as you may, you cannot perceive it. Suddenly it starts up, a few yards before you, and dashes away, and so on, till you abandon the pursuit. Its under side is of sober browns, like the fencing on which it usually alights. Gosse took this insect in the "Grove Lane" at Compton, P. Que. He named it the "Compton Tortoise." (See *Canadian Naturalist,* p. 247).

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Along a by-road leading to the estate of the late Col. Calvin Hall in East Farnham a row of white elms had been planted. When I took notice of them, they were about fifteen feet high. It was in the Fall of the year, when, from some cause or other, the leaves of the elm curl over, and form rolls, on which the veins of their under sides are very conspicuous.

The trees I speak of had been visited by the Sphinx, *Ceratomia amyntor* Hubner, and I found a number of the larvæ of this insect feeding upon them. Strange to say, the larvæ took positions in which they closely resembled the rolled leaves—the ribbed sidelines of the caterpillars mimicking the veins of the leaves.

As the season advanced, the leaves of the elms changed from green to rusty brown, *and a corresponding change took place in the colour of the larvæ.*

But it is time I brought this paper to a close. It is one of reminiscences—a record of days gone by. I have written it in the hope that some into whose hands it may fall may be led by it to take a deeper interest in Nature Studies, to perceive a little more clearly some of the beauties in God's marvellous works, and to look up with deeper feelings of love and reverence to Him, for whose pleasure all these things are and were created.

INSECTS OF THE SEASON IN ONTARIO.

L. Cæsar, O. A. C., Guelph.

With a few exceptions there have not been many complaints this year of serious injury from insect pests.

Orchard Insects.

Codling Moth (*Carpocapsa pomonella*). Each year, even in the most favorable localities for development, adds to the number of those who are proving that one thorough spraying just after the blossoms fall will control this pest. There is no doubt that in old apple orchards the use of gasoline outfits with high pressure has been one of the main factors in obtaining this result. The percentage of infestation this year was high in a few of the warmer districts, due rather to the crop of apples being much smaller than usual than to any excessive number of the insects themselves.

San José Scale (*Aspidiotus perniciosus*). A good many complaints of damage being done by this, our worst insect pest, have been received. This was largely due to the difficulty last spring of getting on the land in time to spray affected trees thoroughly. In some cases old orchards were not pruned and scraped before spraying and consequently it was impossible to do a good job. In a few cases the mixture used may have been too weak.

Plum Curculio (*Conotrachelus nenuphar*). This insect was not nearly so prevalent as usual in most parts of the province, though in some neglected apple orchards in Prince Edward County it was very abundant and had attacked most of the fruit. The surroundings here were specially favorable.

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APPLE CURCULIO (*Anthonomus quadrigibbus*). In several localities I found apples punctured by this pest but the total number affected was small. It is evidently a rare insect in apple orchards in Ontario.

LEAF-ROLLERS (*Archips* spp). From Durham County complaints of damage to apples from so-called "Green Fruit Worms" have been received. On questioning more closely I found that it was not this insect but Leaf-rollers that were responsible. Arsenical sprays are not so satisfactory against these as one could wish, but the total damage done does not, I think, warrant any special treatment. The most common species seems to be *Archips rosaceana* and not *A. argyrosphila*.

LESSER APPLE-WORM (*Enarmonia prunivora*). I have been considerably surprised to see that a large percentage of the so-called Codling Moth injuries to fruit in Wellington County this year has in reality been caused by the Lesser Apple-Worm. This pest is, as mentioned in previous years, very common in haws.

TENT-CATERPILLARS (*Malacosoma* spp.). Both the American and Forest Tent-Caterpillars have spread widely since last year. The former species is now becoming abundant in some counties west of Toronto. East of Toronto and especially from about Trenton on down the St. Lawrence River both species are very numerous and have done much injury to fruit trees. Several kinds of forest trees, especially maples and poplars, have also been severely attacked. From Morrisburg in August I brought to Guelph a number of clusters of egg masses to test how severely these were parasitized. Only about 20 parasites emerged and an examination of the clusters seemed to indicate that the prospects for another serious outbreak next year were only too good. No well sprayed orchard either last year or this year has suffered from these pests. In this connection it is very interesting to learn that the regular spring strength of lime-sulphur applied soon after the caterpillars emerge from the eggs, which is about the time of the opening of the buds, destroys almost all those hit, no arsenical being necessary. This was well tested by Mr. Bradt near Morrisburg on fourteen apple trees, two other trees being left as a check.

FALL CANKERWORM (*Alsophila pometaria*). For the last two or three years this species of Cankerworm has been very abundant and destructive in the County of Wentworth. Wherever the orchards are cultivated and well sprayed it is kept under good control, but many neglected orchards are defoliated. Judging from the number of females to be seen throughout November there will be numerous caterpillars again next year. In the County of Haldimand there is another colony of this insect but I have no report as to the amount of damage being done.

APHIDS. These insects have not been general throughout the province this year but in some localities apple trees have been severely attacked. On the whole I should call it an average year for aphids on all kinds of fruit trees and shrubs. Fruitgrowers are more familiar with the injury they do and are more easily alarmed than would have been the case a few years ago.

APPLE MAGGOT (*Rhagoletis pomonella*). There has been a remarkable diminution in the number of this apple pest, probably due to the excessive moisture and low temperature of the summer and autumn of 1912. I have now discovered its presence in sixteen counties thus showing that it ranges from the extreme east near Ottawa to the west near Sarnia. It is evidently not nearly so serious a pest as it formerly was thought to be.

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BUFFALO TREE-HOPPER (*Ceresa bubalus*). Specimens of apple branches severely attacked by this insect have been received from time to time, but apparently there is no special increase in its numbers.

CAPSIDS. Fewer complaints than usual of injury to fruit have been received. An exception should be noted of some badly deformed apples forwarded from the office of the district representative at London, with the statement that the whole orchard was affected in the same way. I hope, if possible, to visit this orchard next spring and determine the species responsible.

APPLE TREE-BORERS. From St. Joseph's Island and the adjacent mainland there are complaints of serious damage from borers which attack both nursery and orchard trees. These and winter injury are the two great foes to the fruit industry in those parts. I was not able to obtain specimens either of the larvæ or adults but was informed that both the Flat and Round-headed species were at work. The presence of so much forest may be the explanation of the greater degree of injury in these parts.

BUD MOTH (*Tmetocera ocellana*). The effect of our ordinary methods of spraying apple orchards upon the control of this pest was excellently illustrated by two orchards south of Hamilton. One of these has been well sprayed three times each year for several years and scarcely any bud moth larvæ could be found; the neighboring orchard about 200 yards away is neglected and is very severely attacked, worse than I have ever seen an orchard before.

CHERRY FRUIT FLIES (*Rhagoletis cingulata and R. fausta*). These flies though moderately abundant were not so numerous as in 1912. We have not yet been able to determine how widely they are spread throughout the province, but have proven that they are to be found all through the Niagara district and are much more destructive than has been supposed. We have worked out their life histories and means of control with the exception of a few minor points. Next year we hope to give a full account of them.

SHOT-HOLE BORER OR FRUIT TREE BARK BEETLES (*Eccoptogaster rugulosus*). This species of Ipidae seems to be on the increase again. A peculiar or to me new form of injury from it was the destruction of the terminal part of numerous twigs on Sweet Cherry trees near Fonthill. At first sight I felt sure from the dead leaves that the trouble must be due to Brown Rot, but an examination showed that the beetles had bored into the twigs and caused the death of the part beyond.

EUROPEAN RED-SPIDER (*Tetranychus pilosus*). For some time I had suspected that a good deal of the so-called Red Spider work could not have been caused by *Tetranychus binaculatus*. Specimens of the mite were captured and sent to Mr. Nathan Banks who at first thought they must be the Southern Red Spider (*Tetranychus mytilaspidis*) which had escaped from citrus plants in the greenhouse, but on my sending him more material he identified them as the European species, not hitherto reported in North America. This species is most common on European plums but is also found on apples. It probably occurs on many other kinds of fruit trees also though I am not sure of this. I have found it on plums from Forest to Bowmanville, and from Guelph down to Fonthill, so that it is very widely spread and must have been in the province many years. It is I believe more destructive to plums than the ordinary red spider, being apparently much more abundant on these.

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PEAR PSYLLA (*Psylla pyricola*). There have been very few Psyllas seen in the province this year, though here and there complaints of their presence have been reported.

PEACH TREE BORERS (*Aegeria pictipes, Sanninoidea exitiosa*). In the Niagara district a good many peach trees have cankers on the branches caused by the so-called "Gummosis" disease. These wounds have given opportunity for the entrance of borers, apparently the Lesser Peach-borers. From some of the new peach districts of Elgin and Norfolk complaints of injury from *Sanninoidea exitiosa* have also been sent in. In the Niagara district this insect is not often very abundant.

BUSH FRUITS.

IMPORTED CURRANT-BORER (*Aegeria tipuliformis*). Nearly every currant plantation is becoming badly infested with this pest. It looks as if better suggestions for control are badly needed.

RED SPIDER (*Tetranychus bimaculatus*). One of the main causes for the early dropping of currant foliage is the attack of numerous Red Spiders. Nearly every plantation I examined in the Niagara district was affected by these mites.

RASPBERRY ROOT-BORER (*Bembecia marginata*). Old plantations of raspberries in Niagara are severely attacked by this insect. The remedy would appear to be the plowing up of badly infested plots late in autumn after all the eggs have been laid. All roots should of course be collected and burned. This is not a very difficult task. Ploughing as soon as the crop is off would also be satisfactory as the adults have not then emerged but the growers are usually too busy.

VEGETABLES AND FIELD CROPS.

PEA APHIS (*Macrosiphum pisi*). There have been very few complaints of injury from these aphids for three years. In south-western Ontario they have been troublesome again in a few localities this year.

CABBAGE APHIS (*Aphis brassicae*). This pest is again becoming abundant in many parts of the province but is not yet nearly so destructive as it was about five years ago.

ONION MAGGOT (*Pegomyia ceparum*). Many plots of onions have been badly infested with this maggot. Nothing more satisfactory in the way of control has apparently been discovered than Cook's carbolic wash, though this is by no means an easy or entirely efficient remedy.

PERILLUS BIOCULATUS, var CLAUDUS. We are pleased to be able to report the continued presence of this friend in our midst. Whether owing to its aid or some other cause or both, the potato beetles were so effectively kept under control in a number of fields that spraying for them was not necessary.

ASPARAGUS BEETLES (*Crioceris asparagi* and *C. 12-punctata*). Both these insects are now widely spread through the province. The former occurred in

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enormous numbers on a field of asparagus examined during the cutting season near Niagara Falls. Sometimes a single shoot would have 40 or more adults on it and numerous eggs. They are not uniformly abundant in the province each season as they vary greatly in numbers from year to year.

GRASSHOPPERS. In spite of the moist weather of 1912 grasshoppers have been very numerous and destructive in Norfolk County this year. The complaint is made that none of the remedies recommended are giving satisfaction. Serious losses for several years in that county have led to requests for a thorough study of the pest.

HESSIAN FLY (*Mayetiola destructor*). I hoped that the wet weather in 1912 and the late sowing of the wheat would have done much to check the Hessian Fly. These probably did help some but the insect has caused a considerable amount of loss this year again.

FOREST AND SHADE TREES.

SPRUCE GALL-LICE (*Chermes similis* and *C. abietis*). In most districts visited this year there was good evidence to show that some cause was operating to control these two pests. In most cases there had been very few new galls formed this year.

THE EUROPEAN FRUIT LECANIUM (*Lecanium corni*). This scale is remarkably abundant at present on Elm trees in the Niagara district. It has also on several occasions been sent in on Blackberry canes, these being almost covered. Fruit trees in a few localities are moderately infested.

About six years ago this same scale was very prevalent but from some cause, probably parasites, it almost disappeared. I observed that a considerable percentage of the scale this summer showed the emergence holes of parasites so that we are hopeful it will not prove very destructive.

THE TERRAPIN SCALE (*Eulecanium nigrofasciatum*). This once much dreaded pest is still to be seen quite abundant on Soft Maples at St. Catharines and some other places. No trees, however appear to have been specially weakened. The scale is heavily parasitized. I have not yet seen it on any fruit tree.

ENGLISH WALNUT SCALE (*Aspidiotus juglans-regiae*). Many people seeing this circular scale on shade trees and mistaking it for San José Scale have been alarmed lest the cities may be denuded of their deciduous trees. This fear is of course not justified as the scale is not nearly so prolific as the San José and is also quite heavily parasitized, it being a common thing to find 50 per cent. of the insects with parasite emergence holes in them. The Soft Maples are much infested with the English Walnut Scale in St. Catharines and to a lesser extent in many other places. We have also found some species of poplar severely attacked.

An interesting scale insect was found in 1907 by Prof. Jarvis on willows at Collingwood and again by me this year on the same kind of plants at St. Catharines. The Washington experts believe this to be a cross between *Aspidiotus juglans-regiae* and *A. ostreaeformis*.

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THE IMMATURE STAGES OF THE TENTHREDINOIDEA.*

ALEX. D. MACGILLIVRAY, UNIVERSITY OF ILLINOIS, URBANA, ILL.

An interest in the study of the adults of the Tenthredinoidea has emphasized the necesity for some knowledge of the immature stages. The differentiation of species from adult characters is at times a difficult one. It is frequently found that species closely related and difficult to separate as adults have larvæ that are not only very different structurally, but also in their habits. It was hoped from a study of the immature stages of the Tenthredinoidea that some information might be obtained as to the validity of the species based on obscure anatomical details. This opportunity came through the offer of the Maine Agricultural Experiment Station to collect, breed, and study the Tenthredinoidea of Maine during the summer of 1913.

In all phylogenetic studies the groups marking the beginning of things are always not only of the greatest interest, but of the greatest importance, because a study of their structures always shows something as to the origin of the structures found in the higher, more specialized groups of the same order. The superfamily Tenthredinoidea is such an order, so that any morphological study of the forms included within this group should be of particular interest. It contains the most generalized species of the order Hymenoptera, and has been considered by all students of the order as the most primitive group.

The adult insects of this superfamily have the proximal segments of the abdomen similar in form and the abdomen broadly joined to the thorax as in the beetles or locusts. Among all other groups of the Hymenoptera, the conditions are very different. There is a deep constriction between the first and second abdominal segments. The construction is so deep that many systematists have considered this as the point of separation between the thorax and the abdomen. The true first abdominal segment is completely fused with the metathorax and the spiracles borne by this segment, usually considered as the metathoracic spiracles, are the spiracles of the first abdominal segment. This constriction between the first and second abdominal segments of the adult arises during pupal life and is used to separate the Hymenoptera into two distinct groups.

These groups are usually designated as suborders by systematists. To the one including the Tenthredinoidea, the early students of the order gave the name of Phytophaga, from the fact that their larvæ are all plant feeders. The later workers, however, have adopted the name of Chalastogastra, based on the structure of the base of the abdomen. These terms are co-extensive with the superfamily name Tenthredinoidea as here used.

The early systematists divided the group into two families, the Tenthredinidæ and Uroceridæ, the saw-flies and the horn-tails. This grouping was followed for many years, but has been quite generally discarded now. The English entomologist, Peter Cameron, was the first to subdivide these families. He recognized four families, Tenthredinidæ, Cephidæ, Siricidæ, and Oryssidæ, which were subdivided into subfamilies and tribes. These additional families are a result of a splitting of the family Uroceridæ, now known as the Siricidæ through the displacing of the generic name *Urocerus* by *Sirex*.

*Contribution from the Entomological Laboratories of the University of Illinois, No. 38, and Papers from the Maine Agricultural Experiment Station: Entomology No. 70.

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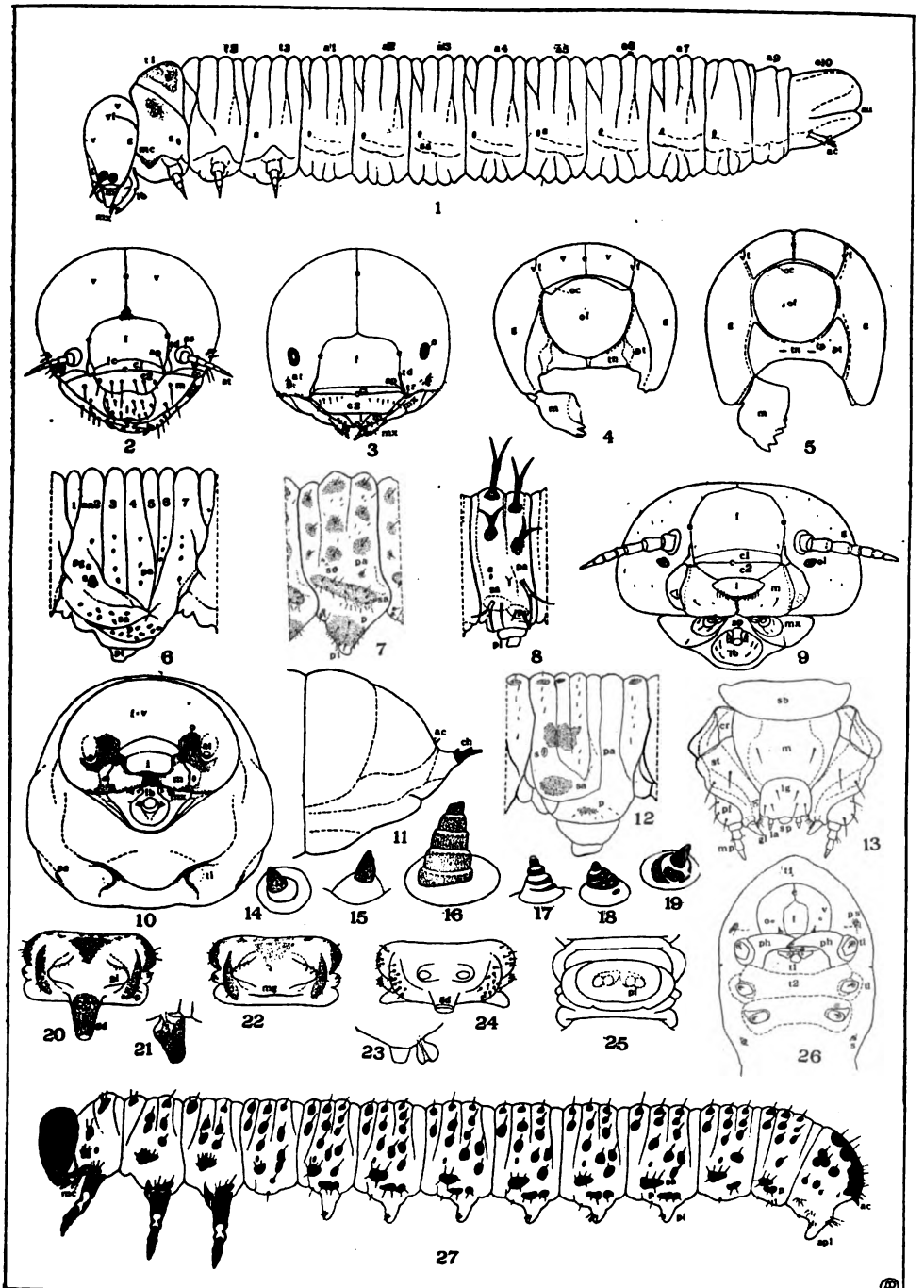

PLATE 1.—Immature stages of the Tenthredinoidea.

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Various subdivisions and combinations have been proposed by modern writers. Konow in 1890, recognized a single family divided into three subfamilies and these in turn divided into eleven tribes. Dalla Torre in his Catalogue, recognizes one family and eighteen subfamilies. A still different grouping is that of Ashmead, published in 1898, where eighteen families are recognized, but different in extent from those of Dalla Torre. The most recent grouping is that of Rohwer, who would divide the group into four superfamilies. These superfamilies comprise fourteen families, and one of these families, the Tenthredinidæ, includes eleven subfamilies. In the following paper the classification proposed by the writer in 1906, based on a phylogenetic study of the wings, has been followed, in which a single superfamily and nine families are adopted. Representatives of the families Blasticotomidæ and Megalodontidæ are not found in America, and they are not considered in any reference in the following pages to the group as a whole. These families would be grouped as follows:—

The generalized Tenthredinoidea.

The vein R_2 conservers ..... *Xyelidæ*
The vein R_2 losers ..... *Pamphiliidæ*

The specialized Tenthredinoidea.

The cell R_4 group.

Primitive cell R_2 conservers ..... *Blasticotomidæ*
Primitive cell R_2 losers ..... *Tenthredinidæ*

The cell R_5 group.

The radial cross-vein and M_2 conservers.

The Medio-cubital cross-vein conservers ..... *Xiphydriidæ*
The medio-cubital cross-vein modifiers.

The M and *m-cu* equalizers.

The Cell $C+c_1$ losers ..... *Siricidæ.*
The cell $C+Sc_1$ conservers ..... *Megalodontidæ.*

The M and *m-cu* modifiers ..... *Cephidæ.*

The radial cross-vein and M_2 losers ..... *Oryssidæ.*

The great difference in the number and rank of the groups is due in the main to the difference in opinion as to what position shall be assigned the components of the restricted family Tenthredinidæ. This family contains a large complex of genera that are readily segregated into a number of definite groups that are easily differentiated by means of structural characters, but they all have a similar or common habitus. The writer believes that these groups are best handled by considering them simply as subfamilies. In the work referred to above, twenty-four subfamilies are listed. Of these, the following are found in the United States and Canada:

Contraction of the anal cell conservers ..... *Lophyrinæ*
Emphytinæ
Selandriinæ
Dolerinæ
Phyllotominæ

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Contraction of the anal cell losers.

Anal cell conservers.

Second anal vein conservers ..... *Lycaotinæ*
Tenthredininæ
Cimbicinæ

Second anal vein losers.

Second anal cell reduced by atrophy.

Costal area conservers.

Radial cross-vein conservers ..... *Hoplocampinæ*
Dineurinæ

Radial cross-vein losers ..... *Monocteninæ*
Cladiinæ
Nematinæ

Costal area losers ..... *Blennocampinæ*
Fenusinæ
Scolioneurinæ

Second anal cell reduced by coalescence ..... *Hylotominæ*
Schizocerinæ

Anal cell losers ..... *Acordulecerinæ*

There are many facts in the development of the Tenthredinoidea of great interest. One of these is the method of reproduction of many of the species. A great variation exists in the number of individuals of the two sexes; in only a few species are the males as numerous as the females. The males, while frequently differently colored, do not ordinarily differ markedly in structural characters, though they are usually smaller in size. The number of males is always less, not only among captured, but among bred individuals. Males are unknown in certain species, while in others, where the males are known, the females reproduce parthenogenetically. Practically none of the American species have been experimented with from this point of view, but much has been written with regard to the European forms. Von Siebold has shown that males are unknown for about one-fifth of the German species and Cameron that they are unknown for about one-third of the British species. The fact that no males are known for any given species does not signify that the species reproduces only parthenogenetically, for many of the species are rare, in many cases only a few individuals have been collected, the number of males is always much less than that of the females, so that the possibility of the collection of males is much less. It has, however, been shown conclusively by many different investigators that eggs laid by virgin females of certain species will produce larvæ. The parthenogenesis is a mixed one, for among the known parthenogenetic species males are known for certain species and in the case of these species larvæ may be produced from eggs laid either by virgin females or impregnated females. The conditions would suggest that the parthenogenesis was a progressive one, for in certain species the eggs laid by virgin females produce both males and females, in others only males, and in still others only females. The known parthenogenetic species all belong to the family Tenthredinidæ. *Pteronus ribesii* and *Lygaeonematus erichsonii* are well known examples.

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The eggs are always laid by the female within the tissue of the host plant. Where the larvæ are borers, Xiphydriidæ, Siricidæ, Cephidæ, and Oryssidæ, they are laid in holes bored in the stems of bushy plants or in the limbs or trunks of living or recently dead trees. Where the larvæ are leaf-feeders, the eggs are placed in slits sawed by the female from the under surface and located between the two layers of parenchyma. A few species insert their eggs in the petiole of the leaf, some of the gall-making species in the leaf-buds, and *Hoplocampa cookei* in the blossoms of cherry on the sepals or the upper part of the calyx cup. The eggs are oval in outline, flattened, usually white in color, though sometimes bluish or greenish, and very difficult to locate when first laid. They swell after a short time, varying with the species, to twice their original size and push out the surface of the leaf so that it appears to be covered with little mounds. The end of the egg may project from the slit at this time. The cause of the swelling is unknown.

The number of eggs laid in a single leaf varies greatly. A large majority of the species distribute their eggs over the adjacent leaves of the host plant, one or two in a leaf, and some, if one may judge from the distribution of the larvæ collected, on widely separated bushes. Some species on the other hand lay a large number of eggs within the same leaf, as in the case of *Macremphytus varians,* thirty or forty, distributing them generally over the under surface, while in *Pteronus fulvicrus* there are usually about twenty placed in a group at the extreme tip of the leaf.

The eggs are usually located along the larger veins, as in *Pteronus ribesii* or along the margin of the leaf. In *Macremphytus* they are placed near the secondary veins, but in *Pteronus fulvicrus,, Cimbex, Trichiosoma,* and many of the species whose larvæ are leaf-miners, the veins are disregarded. From twelve days to three weeks are required to complete the embryonic life. The young larvæ issue through the slit made in the leaf by the female in inserting the egg.

The length of the feeding time of the larval life varies considerably with the species. There are five to seven instars, the number being different in the different groups, which usually require about fifteen days, sometimes as few as twelve in some species, and as many as twenty or even more in others.

Each species is quite constant in its method of feeding; that is, whether the larvæ feed singly, solitaire, or a number together, gregarious. The way in which the eggs are placed by the female has much to do with this. In no species where the eggs are well distributed has it been noted that the larvæ were other than solitary feeders, but in *Macremphytus,* where many eggs are laid in a group, the larvæ feed gregariously for the first half of their life and solitary for the last half, while in *Pteronus fulvicrus,* where the eggs are also laid in a group, the larvæ are gregarious throughout their feeding period. An apparent exception is found in the case of the larvæ of the Lophyrinæ, where a number of eggs are placed in the needles at the apex of a single branch and the larvæ become gregarious through the consumption of the adjacent needles.

The manner of feeding is strikingly varied. In many nematids and hoplocampids, the young larvæ as soon as they emerge from the egg eat holes through the leaf and continue feeding around the circumference of the hole, clinging to the leaf with their thoracic legs and holding the body S-shaped in the hole. When a number of eggs are placed adjacent to each other, the larvæ continue this method, feeding until this portion of the leaf is devoured, and then they migrate to another part of the leaf or an adjacent leaf and are edge feeders for the remainder of

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their feeding life. Some species are leaf-skeletonizers for the first two or more instars and then either feed from the edge or eat holes in the leaf. The great majority of species are edge feeders. In some groups, as the Nematinæ and Hoplocampinæ, the larvæ cling to the edge of the leaf with the thoracic legs and with the abdomen lying against the edge of the leaf, but free. There are exceptions even in these subfamilies, for some of the species cling to the upper or lower surface of the leaf, as *Pteronus thoracicus*, which feeds stretched out flat on the upper surface and holds itself in place with the thoracic legs. The Emphytinæ and Selandrinæ rest stretched out flat on the under surface and feed at the edge or eat holes in the leaf. Some of the species of these subfamilies throughout their feeding period and others as they approach the end of their feeding period curl themselves up into a ring or helix-like and cling to the under surface of the leaf with their thoracic legs. The Phyllotominæ are leaf-skeletonizers throughout their feeding period and feed from the under surface. They remove only the lower parenchyma. Most Cladiinæ are also leaf-skeletonizers, but they remove everything but the larger veins. The Pamphiliidæ feed both solitarily and gregariously. The solitary feeders roll the edge of a leaf, tying the folds together with silk, forming a case open at each end, in which they live and feed upon the edge of the leaf. The gregarious feeders tie several leaves together with silk, forming an irregular nest and feed upon the enclosed leaves. The larvæ of this family are the only members of the superfamily that spin silk other than for the formation of the cocoon, that occur in the United States or Canada. The larvæ of *Cimbex* and *Trichiosoma* cling to the dorsal surface of the leaf with their thoracic legs and feed on the edge of the leaf; when not feeding they rest with the body curled helix-like. The members of the subfamily Lophyrinæ feed on various species of conifers; they clasp the needles between the thoracic legs and feed at the free end. The larvæ feed on the needles until only short stubs are left and then migrate to others, so that, while the eggs are placed singly or only a few in a needle, they become gregarious in the latter part of their feeding period from the consumption of the greater part of the needles on the branch. Some species will feed only on the needles of the year old growth, others are indiscriminate, feeding either on the new or the old growth. None of the larvæ of the Dolerinæ have been absolutely identified for the American species. What are believed to be larvæ of this subfamily are grass and sedge feeders. They usually occur singly or several individuals on the same stem, clasping it with their thoracic and abdominal legs. The Acordulecerinæ feed only on the under-surface. They are gregarious, arrange themselves in a file along one side or across the end of the leaf and feed toward the stem, leaving intact the larger veins, so that the tip looks badly frayed. The frayed leaves seen commonly in July and August, on oaks is the work of the larvæ of this subfamily. The species that I have studied are double brooded. The Scolioneurinæ and Fenusinæ are leaf-miners and feed in blotch-mines in the leaf.

The larvæ that cling to the edge of the leaf with the thoracic legs are rarely easily jarred from the host plant. The same is true of a number of those species that have the thoracic legs well developed and cling to the surface of the leaf. The larvæ of the Emphytinæ and Selandriinæ are very easily disturbed. It is impossible many times to turn over a leaf containing a larva in order to examine it without its dropping to the ground and coiling itself up into a ball that is usually difficult to locate. The larvæ of *Macrophya* and *Tenthredo* also have this same habit. The most sensitive larva that I have examined is one that is found

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on the Tall Meadow Rue (*Thalictrum polygamum*), where it feeds on the white flower clusters. These larvæ will drop to the ground when one is four or five feet from the plant on which they are feeding. When they reach the ground they curl themselves up in a ball. The adult has not been bred. In striking contrast to this larva is that of *Dimorphopteryx,* which feeds resting upon the upper surface of the leaves of birch, linden, maple, black oak, and shadbush. It is impossible to shake these larvæ loose and difficult sometimes to pull them loose with the forceps.

The larvæ of certain genera and subfamilies of Tenthredinidæ are entirely different in appearance during their last larval period; white larvæ may become spotted, the spotted white or green, and the spiny spineless. When the larvæ are through feeding, they cast their skin, which may take place either before or after leaving the host plant. It is the period during which they are preparing for pupation. For one who has not observed the differences found at this time it is difficult to appreciate the change that takes place. My first experience was with a larva that was glazed white when I examined it in the afternoon; the next morning the breeding cage contained almost entirely larvæ that were white with small irregular black patches. This stage has been named by Dr. H. G. Dyar, who has done more than all the other American workers together in elucidating the transformations of the Tenthredinoidea, the ultimate stage. The assumption of an ultimate stage does not seem to be peculiar to subfamilies or genera. The modifications in color and structure will be discussed more fully later.

There is considerable variation in the method adopted by the larvæ in preparing for pupation. The Xyelidæ and Pamphiliidæ transform in cells in the ground. The species of Emphytinæ and Selandriinæ for the most part bore into rotten wood; this is particularly true of the species that feed on different species of ferns, of which there is a considerable number. These larvæ will transform in absolutely no other way. They will travel round and round a breeding cage for days searching for the rotten wood, and if placed upon a piece, will be out of sight within it in a few minutes. They cut a smooth, straight tunnel of the same diameter as their bodies and plug the open end with the dust from their cuttings. The tunnel is usually not lined with silk, although a few species prepare a very slight silken lining. All the species of *Macremphytus, Emphytus, Strongylogastroidea, Strongylogaster,* and *Taxonus* transform in this way, also a few nematids. The larvæ of the Blennocampinæ, transform in cells in the ground. The Lopherinæ, Dolerinæ, Phyllotominæ, Tenthredininæ, Hoplocampinæ, Hylotominæ, and most Nematinæ transform in cocoons just beneath the surface of the ground and in the breeding cage will form their cocoons, if no soil or trash is provided, on the bottom or side of the jar. Some Lophyrinæ, also *Cimbex* and *Trichiosoma,* sometimes attach their cocoons to the host plant. The cocoons of all these groups except the Hylotominæ are brownish or blackish in color and dense in structure, the cocoons of the Hylotominæ on the other hand are white and lace-like and appear much larger in size in proportion to the size of the adult. The cocoons of the Acorduleceriæ are minute, dense, and opaque white in color, and are probably placed just beneath the surface of the ground. They were made among the debris of the food material in the bottom of the cage. The Scolioneurinæ and Fenusinæ leave their mines and enter the ground, where a part of the species at least form cocoons. The larvæ of the Xiphydriidæ, Siricidæ, Cephidæ, and Oryssidæ transform in their tunnels, some, if not all,

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forming cocoons. Most of the larvæ of the genus *Pontania* which form galls or abnormal growths on the leaves of *Salix* and *Populus*, leave the galls and transform in cocoons in the ground, in rotten wood, or in the pith of plants, differing with the species. Some of the species leave their galls and evidently crawl over the bush and enter the vacant galls of cecidomyiids or of other individuals of the same species, where they transform. Practically all the adults of *Pontania pisum* that I have seen were bred from cecidomyiid galls collected on *Salix*. The larvæ of *Euura*, which form galls on the stems of *Salix*, transform in cocoons either in the galls or enter the ground. The larvæ of the Cladiinæ transformed in the breeding cages in cocoons made of a thin, transparent, homogenous sheet of silk formed between the leaves of the food plant. In nature they probably transform in the ground.

In most insects with a complete metamorphosis that transform in rotten wood, in cocoons, or in cells in the ground, the body of the larva becomes shortened while preparing its place for pupation and almost immediately after its completion, a few days at the most, the last larval skin is shed and the pupal condition is assumed. A very different condition is found in the Xyelidæ, Pamphiliidæ, and Tenthredinidæ. The most of the species are single brooded, that is, the larvæ emerge early in June, complete feeding by the end of the month, enter the ground or rotten wood, spin cocoons, and the adults emerge the following April or May. Writers in referring to the transformations of species of these groups frequently state that they pupated at a certain date, referring to the time when the larvæ entered the ground or rotten wood. Such a statement is incorrect, for in all the species so far as known, the insect lives as a larva until the following spring, March or April, or even later. The pupal period is, therefore, very short and many of the metamorphic changes must take place during this quiescent period of the larva. The larvæ of the leaf-feeders, if one may judge from breeding cage experiences, have many idiosyncrasies. Just before they are ready to cast their larval skins and become pupæ, they may leave their cocoons or earthen cells or their tunnels in rotten wood and force themselves to the surface of the soil, where they will remain as if dead, only wriggling the body when disturbed. Such larvæ may pupate on the surface of the soil and produce adults or they may die. The larvæ are very subject to the attacks of hymenopterous and dipterous parasites, but in no case observed did any of these larvæ produce parasites.

The pupæ are typically hymenopterous in type, the antennæ, legs, and wings are enclosed in separate cases, the wings are pad-like in structure. The pupæ are ordinarily green in color, becoming darker with age, sometimes with yellow or orange spots. The pupal state lasts about twelve or fifteen days. The adults when they emerge from the pupal skin remain in the place of pupation until the wings are fully expanded and the cuticular parts hardened. They emerge from the cocoon by roughly cutting out one end; but in the Lophyrinæ and *Cimbex* and *Trichiosoma* a neat lid is cut and is left attached to the cocoon.

With the exception of the Tenthredinidæ, all the species are clearly single brooded. While many of these are single brooded, others apparently have more than one brood. Any statement as to the number of broods should be made with care. It is a well known fact of observation that many species of insects, probably a large majority, appear at a stated time, the males frequently a few days before the females, a week or ten days covering the entire period. This is not true in this family, for adults may appear over a period of four to six weeks, so that with some species, full grown larvæ and just emerged

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larvæ may be found on the same leaf. Some of the first larvæ to emerge may have matured, pupated, and produced adults. For the sake of convenience, the females developed from wintering larvæ may be designated, as spring emerging females and those developed from larvæ produced the same summer as summer emerging females. The small larvæ found on the same leaf with the almost mature larvæ may have been produced from eggs laid by late maturing spring emerging females or they may have been produced from eggs laid by a summer emerging female. There results field conditions that would warrant the considering of the species as single brooded, while breeding experiments would show two or more broods.

It is a matter of record that there is a second lot of larvæ produced in the case of *Pteronus ribesii, Lygaeonematus erichsonii, Taxonus nigrisoma,* and various species of *Lophyrus.* The number of larvæ produced at this time is always much less than the number produced by the spring emerging females. There is no question but that in many species, only a small number of the larvæ produced by the spring emerging females pupate the same season and emerge as adults; the great majority do not emerge until the following spring. So that in most species a full second or third brood does not exist.

That the great majority of the species of Tenthredinidæ are single brooded and the other species partial second or third brooded is also shown by the collection of adults. They are most abundant during six weeks or two months of the spring, May and June or June and July, depending upon the latitude and the altitude of the region. Only a few individuals are taken after this period, as is shown by the many collections that have been received for identification and my own collecting during the past twenty years. The adults are usually taken flitting about on or near the host plants upon which the larvæ feed. They are found more abundantly during the early part of the forenoon in sunny places. The great majority of the species are peculiar to the boreal and transitional zones, but in the east and middle west extend into the upper austral zone. A limited number of species extend into the lower austral, while the subfamilies Hylotominæ, Schizocerinæ, Acorduleceriнæ, and certain genera of *Selandriinæ* find their greatest development in tropical regions.

The food-plants of the larvæ are, therefore, for the most part such species as are peculiar to the boreal and transitional zones. The various conifers, species of *Salix, Alnus, Betula, Quercus,* various genera of filices, *Populus, Viburnum,* and *Sambucus* harbor the largest number of species. The species of *Cornus, Corylus, Fragaria, Carya, Rumex, Ulmus,* and the various kinds of sedges are next in importance, while the following are the more important of the remaining host plants: *Amelanchier, Fraxinus, Pyrus, Crataegus, Rosa, Prunus, Rubus, Viola, Robinia, Acer, Juglans, Tilia, Carpinus, Ostrya, Polygonum,* and *Vitis.*

Before the taxonomy of any group can be accurately determined, the structure of the forms to be grouped needs to be carefully examined. But little has been done in homologizing the parts of the external skeleton of the larvæ of any of the orders with a complete metamorphosis and practically nothing has been written dealing with the anatomy of the larvæ of the Tenthredinoidea. This is sufficient reason for a somewhat detailed discussion of their external anatomy.

The larvæ of the Tenthredinoidea, with the exception of the leaf-miners, are cylindrical in form (Figs. 1 and 27), caterpillar-like. They consist of a well differentiated, globular head and a series of similar segments. The segments are clearly indicated and the thoracic segments can be distinguished by their form

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and position in the legless species and by the presence of true thoracic legs in the remainder. The larvæ of the leaf-miners are usually depressed, the body is moniliform with the head depressed and triangular in outline.

The entire head and body, as is common with all insects, are covered by a sheet of cuticle, which is thin and transparent in many species of Tenthredinoidea. It is so transparent in some species that the form of the dorsal vessel or heart, the alimentary canal in part, the air-tubes or tracheae, and the form and location of a part of the masses of adipose tissue or fat, can be determined in the living animal.

The head (Fig. 27), except as specified above, is globular in outline and the mouth directed ventrad or caudad. The external head skeleton, the head capsule, is strongly chitinized, fixed in form, and not readily changed from its natural shape. The shape and hardness of the head distinguish it from the remainder of the body. The only other difference worthy of note is found in the genus *Dimorphopteryx,* where the head is distinctly triangular in outline. The head in the Xyelidæ, Pamphiliidæ, and Tenthredinidæ is fully exposed, but in *Cephus* and *Tremex* (Fig. 10), a condition exists which is probably characteristic for all the boring larvæ. The cephalic part of the prothorax on the dorsal and lateral aspects is produced into a broad fold which conceals the caudal part of the head. This condition undoubtedly marks an early stage in the retraction of the head into the thorax, so characteristic of many of the larvæ of the higher Hymenoptera. The parts of the head may be divided into two classes, the fixed parts and the movable parts.

The fixed parts of the head comprise all the immovable parts of the head skeleton. The surface of the head skeleton may be entirely glabrous or with a few scattered setæ about the ventral margin as in *Pamphilius* or with numerous promiscuously arranged short setæ, more abundant on the ventral half of the head, as in *Tremex, Lophyrus, Caliroa, Abia,* and *Croesus* or with long setæ as in *Pteronus* or with numerous very long setæ as in *Trichiocampus.* The surface may also be polished, opaque, or roughened. If the surface is roughened, there can usually be recognized many closely placed quadrangular or oval areas with one or more central brownish spots. These areas are distinct in *Cimbex, Empria, Lagium,* and *Lygaeonematus.* They probably mark the location and extent of the hypodermal cells located beneath the cuticle.

There is a large opening in the caudal aspect of the head (Figs. 4 and 5, of) the occipital foramen, through which the alimentary canal and other organs pass from the head to the thorax. This opening can not be identified, except in a general way, until the head has been removed from the thorax.

In the heads of adult generalized insects, as the cockroach, there is a suture (Figs. 2, 3 and 9, e), the epicranial suture, extending from the caudal aspect of the head along the meson to the middle of the cephalic aspect, where it divides into two arms, which extend toward the compound eyes, making a figure shaped like an inverted Y. This suture can be identified on the heads of most Tenthredinoidea as a faint line, like a break in the cuticle in brown or black colored heads and as a slightly depressed line in opaque white colored heads. The compound eyes are wanting in larvæ and the arms of the Y after making a broad curve (Fig. 3, e) extend directly to the ventral margin of the head capsule. The exact course of the arms of the epicranial suture varies but little in different species. The stem of this suture originates at the occipital foramen (Figs. 4 and 5, of). In *Tremex* (Fig. 10), all parts of the epicranial suture are wanting.

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Arising from the dorsal part of each lateral margin of the occipital foramen, there is on each side a furrow or suture, more distinct than the epicranial suture, which extends in a broad curve across the lateral aspect of the head to the cephalic aspect, where it becomes obsolete (Figs. 1, 4, 5, and 27, vf). These are the vertical furrows. They are not represented in lepidopterous larvæ. They are also wanting in the Scolioneurinæ and Fenusinæ and *Phlebatrophia,* which is a leaf-mining phyllotomid. In *Cephus* the vertical furrows are distinct, but do not project beyond the cuticular fold of the prothorax. They are also present in *Tremex,* but not so distinct as in *Cephus.*

The dorsal, lateral, and the greater part of the cephalic and caudal aspects of the head form a single area, the epicranium. This area is ordinarily subdivided into three definite areas, the vertex, the front, and the genae, but in larvæ and generalized insects the number is greater. In some species these areas or sclerites are surrounded by sutures; in others a part of sutures are wanting.

The shield-shaped area enclosed by the dorsal part of the arms of the epicranial suture is the front (Figs. 1, 2, 3, and 9, f). There is not much variation in the size or shape of the front; the most marked is as to whether it is as broad or broader than long. In *Scolioneura* the stem of the epicranial suture is only about one-half the length of the arms and the dorsal end of the front is an acute angle. The surface of the front is usually similarly sculptured to the adjacent parts. An exception is found in *Cimbex,* where it is roughened by irregular anastomosing lines.

The area on the dorsal aspect of the head included between the vertical furrows is the vertex (Figs. 1, 2, and 4, v). It extends ventrad on each side of the front to the ventral margin of the head and bears on its ventral portion the antennae (Fig. 2, at) and the simple eyes or ocelli. The vertex is divided into two distinct pieces by the stem and arms of the epicranial suture. The front and vertex are fused in *Tremex* through the obsolescence of the epicranial suture (Fig. 10). In lepidopterous larvæ there is a narrow plate, the adfrontal plate, formed by the fusion of a part of the tentorium to the ental surface of the vertex along the epicranial suture and extending as a narrow plate along each lateral margin of the front like an inverted V. This plate is wanting in the Tenthredinoidea.

The caudal portion of the head between the parts of the vertex on each side is occupied for the most part by the genæ (Figs. 1, 4 and 5, g). The genæ can not be considered other than as an area in these larvæ; there are no sutures separating it from the vertex. It is questionable whether it is ever more than an area of the vertex. The portion of the head between the eyes and the ventral margin of the head is usually designated as the genæ.

Between the genæ of each side and the lateral margin of the occipital foramen, there is a distinct triangular sclerite in *Pamphilius,* the postgenæ (Figs. 4 and 5, pt.). The apex of this triangle is located at the caudal end of a vertical furrow and its base forms a part of the ventral boundary of the head. The suture forming the lateral boundary of each postgena is not so distinct in *Cimbex,* and each postgena, while triangular in outline, extends only to the middle of the lateral aspect (Fig. 5).

There is a transverse suture in *Pamphilius* extending on the dorsal part of the caudal aspect of the head between the caudal ends of the vertical furrows, separating off a distinct sclerite, the occiput (Figs. 4 and 5, oc). This suture is subobsolete at the middle of its course and the occiput is distinctly constructed at middle. In *Cimbex* this suture extends on each side to the dorsal end of a postgena and

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in no part of its course is it as distinct as in *Pamphilius*, while the occiput can be identified as a narrow band of cuticle closely fused with the vertex and genæ. There is no well marked suture between the occiput and postgenæ in *Cimbex*.

On the ventral part of the cephalic aspect, there is a distinct suture in both *Pamphilius* and *Cimbex* and related species connecting the ventral ends of the arms of the epicranial suture. This is the clypeal suture (Figs. 2, 3, and 9, c.), so named from the fact that it separates the two parts of the clypeus and should not be confused with the fronto-clypeal suture (Fig 2, fc), which will be described later.

Adjacent to the ventral margin of the front and the ventral ends of the arms of the epicranial suture there are several small sclerites. Just ventrad of the middle of each arm of the epicranial suture, there is a distinct pit, which marks the point of attachment of the dorsal arms of the tentorium (Figs. 2 and 3, td). At the ventral ends of the arms of the epicranial suture, there are also distinct thickenings, which mark the point of attachment on the ental surface of the head of the anterior arms of the tentorium. There are short sutures extending from the point of attachment of the dorsal arms of the tentorium to the clypeal suture. The small triangular areas (Figs. 2 and 3, ap) on each side enclosed by the sutures just named and the arms of the epicranial suture have been given the name of antecoxal pieces of the mandibles by Comstock. They do not so far as I am aware occur other than in the larvæ of insects with a complete metamorphosis and then only in the more generalized groups. In the ventral margin of each antecoxal piece, there is a distinct notch. This notch forms an acetabulum for the cephalo-mesal condyle of the mandible.

Along the ventral margin of the gena there is another small, transverse sclerite, which is also peculiar to generalized insects, but is found in both larvæ and adults. The mesal end of this sclerite (Figs. 2 and 3, tr) is adjacent to the antecoxal piece of the mandible. These sclerites have been named by Comstock the trochantins of the mandibles. They are well developed in *Pamphilius*.

In *Pamphilius* there is a faint transverse suture (Figs. 2, fc) extending from the middle of the suture forming the mesal boundary of an antecoxal piece to the corresponding suture of the opposite side. On the ventral side of this suture, there is a narrow transverse plate (Figs. 2, 3, and 9, c1), bounded on its ventral side by the clypeal suture. This narrow plate is the first clypeus and the plate along its ventral margin and separated from it by the clypeal suture is the second clypeus (Figs. 2, 3, and 9, c2). The faint suture extending between the antecoxal pieces and forming the dorsal boundary of the first clypeus is the fronto-clypeal suture. The second clypeus usually has its lateral margins oblique and its ventral margin emarginate. In many species of larvæ the fronto-clypeal suture is obsolete and the first clypeus is fused with the front, but in some the first clypeus has been greatly reduced in size and the clypeal suture becomes faint or obsolete and the fronto-clypeal suture is distinct. In generalized adult insects, the clypeus, so called, is a fusion of the antecoxal pieces of the mandibles, and the first and second clypeus; the lateral ends of the clypeal suture are frequently distinct and the mandibles are articulated with the lateral ends of the clypeus. This articulation is undoubtedly homologous with the articulation found in the antecoxal piece of the mandible described above.

There is a small movable flap, the labrum (Figs. 2, 3, and 9, l), attached to the ventral margin of the second clypeus. The labrum is usually emarginate along

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its ventral margin; in some species the emargination is so deep as to almost divide it into two pieces. The labrum varies considerable in size and shape.

In the larvæ of insects with a complete metamorphosis, the eyes, if present, are represented by one or more simple eyes or ocelli, placed in a group on each lateral aspect of the head. The portion of the head capsule bearing this group of simple eyes is usually different in color or in sculpture. In order to differentiate this region from the adjacent parts, it has been designated as the ocularium (Fig. 9, ol). The ocularium in the Tenthredinoidea bears a single ocellus (Fig. 3, o). The presence of a single ocellus on each side of the head is the most useful character for differentiating the larvæ of the Tenthredinoidea from those of the Lepidoptera, which usually have five or six.

In certain larvæ the mouth is directed to the front and certain of the neck pieces fill the space on the ventral aspect of the head. The area, designated as the gula, is wanting in the larvæ of the Tenthdelinoidea.

The external head skeleton is supported by three pairs of pillars, which extend in different directions, and are known as the tentorium. The postgenæ are connected by a transverse bar, which extends within the cavity of the head. This bar is a part of the tentorium (Figs. 4 and 5, tn). It is known as the body of the tentorium. The place of attachment of two of the pairs of arms of the tentorium has already been described, the third is attached near the ends of the body of the tentorium (Fig. 5, tp).

The movable parts of the head comprise the antennæ, the mandibles, the maxillæ, and the labium.

The antennæ are inserted in round depressions, the antennal sockets, located on each side of the head near the ocularium. In *Pamphilius* (Fig. 2, as) they are placed between and a little above the ocularium and the front; in *Cimbex* (Fig. 3, at), between the ocularium and the ventral margin of the vertex, their usual location in the larvæ of the Tethredinidæ; and in *Tremex* (Fig. 10, at), they are located laterad of the ocellus, the ocellus being placed between the antennal sockets and the front.

The antennal sockets (Fig. 2,, as), are surrounded by a membranous ring in the Pamphiliidæ, but in all the other larvæ examined they are completely filled by the proximal end of the antennæ. The antennæ of the Pamphiliidæ (Figs. 2 and 9, at), are the most generalized in form. In this family they consist of seven segments and their length is equal to one-half the width of the head. In no other Tenthredinoidea examined do they approximate such a condition, while they may consist of as many as five segments, yet they are hardly more than mere tubercles in length. The fusion and reduction of the segments of the antennæ are gradual and are of value in showing the sequence of the groups. In the Emphytinæ, Dolerinæ, Selandriinæ (Fig. 16), and some others, they consist of five ring-like segments; in the Nematinæ (Fig. 18), they consist of transverse plates that appear to be closely appressed to the surface of the antennal socket, each plate is supplied with sensory setæ and represents an antennal segment; in the Acorduleceriæ there are only two of these plates; and in *Cimbex* (Fig. 14), they are reduced to mere blunt stubs.

As already noted, one of the condyles of each mandible articulates in an acetabulum in an antecoxal piece (Figs. 2 and 3), the other condyle articulates in an acetabulum on the caudal aspect of the head at the ventral end of the suture separating the gena and postgena (Figs. 4 and 5). The mesal margin of each mandible closes under the edge of the labrum and clypeus, is provided with prominent teeth, and together with the clypeus and labrum closes the ventral part of the head. (Fig. 9).

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The caudal part of the mouth-cavity is closed by the maxillæ and. labium. They form a transverse band with the labium in the centre and the maxillæ on each side (Fig. 9). The maxillæ of *Pamphilius* (Fig. 13) is the most generalized. Each contains a cardo (cr) consisting of two pieces, a proximal, quadrangular area and a distal triangular area. The cardo is bent at right angles to the stipes (st) and separated from it by a distinct suture. The ectal surface of the stipes is an oblique, strongly chitinized plate, which bears on the lateral margin of the distal part a prominent rounded shoulder, the palpifer (pf), which in turn bears a four segmented maxillary palpus (mp). The distal end of the stipes bears on its lateral corner a two segmented appendage, not so strongly chitinized as the other parts and with the distal segment bluntly and roundly pointed. This two segmented appendage is the galea (gl). The mesal margin of the distal end appears as a continuation of the ectal chitinzed plate of the stipes, much broader at its distal end than the galea and bearing a number of black setæ. This is the lacinia (lc), its form can be determined best from the ental surface. In the larvæ considered as standing higher in the series as *Cimbex, Trichiosoma, Macremphytus,* and *Croesus,* the same parts can be identified, but all the parts are soft and uniformly chitinized and without differentiation into sclerites on the ectal surface except by transverse folds. The maxillary palpus has fewer segments, two or three, and the lobe bearing the palpifer is expanded.

The labium (Fig. 13) in *Pamphilius* consists of a broad proximal piece, the submentum (sb), concave at its distal end, in which the transversely oval mentum (m) fits. The distal portion of the labium, the ligula (lg), bears a pair of segmented appendages on its distal end, the labial palpi (la). On the ental surface of the ligula and laterad of the labial palpi, there is on each side a protuberance, a paraglossa. Between the labial palpi and arising on the ental surface, there is a prominent lobe, which represents the glossa. The glossa has been modified into a spinneret (Figs. 9, and 13, sp.) for the opening of the duct of the silk glands. The spinneret in *Cimbex* and most other larvæ of the Tenthredinidæ, is located at the distal end of the labium. The shoulder bearing the labial palpi in *Pamphilius* is inconspicuous but is large and distinct in *Cimbex,* the labial palpi are also more prominent.

The head is usually a different shade of color from the remainder of the body. It may be entirely black, brown, green, white, or spotted. When spotted there appears to be a definite relation between the spots and the head areas, as the front, the dorsal part of the vertex, the genæ, and the ocularium. When the head is black, the minute ocellus, which is usually white, is readily identified. The ocularium in most of those larvæ where the head is pale, is a prominent, round, black spot with the ocellus placed at its centre or nearly so. (Figs. 1, 2, and 3). A common type of marking in the Nematinæ, where the head is usually green or white, is to have a fuscous shade along the parts of the epicranial suture and the vertical furrows. In the Emphytinæ and Selandriinæ the head markings are various combinations of a spot on the vertex between the vertical furrows, a spot including the ocularium and extending to the caudal margin of the head, and a spot on the front. The spot on the front may be wanting and the spot about the ocularium expanded until it meets the spot on the vertex, forming a broad black band around the circumference of the head and giving the head the appearance of being covered by a sun-bonnet. This was a common type among the supposed dolerid larvæ. The spots on the front and about the ocularium may be

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reduced to a narrow, connected band forming a continuous mark across the lateral and cephalic aspects of the head. Larvæ marked in this way usually hold the head so that the black line coincides with the cut edge of the leaf. The second clypeus and labrum are usually of the same color as the head. In the black-headed species they are sometimes lighter or entirely pale.

The head is usually very pale in color immediately after moulting. If the head is normally green or white in color, this is not noticeable, but in the black or brown headed species it is strikingly so. In the Tenthredininæ, while some of the species have the head entirely green or white throughout their life, most of those studied had one or more black spots. These were located on the vertex, front, or genæ. Although usually coal black in color, they completely disappeared during the ultimate stage and the head became glassy green in color.

The region behind the head consists of thirteen segments, the cephalic three (Fig. 1, tl-3) belong to the thorax and the caudal ten to the abdomen (Fig. 1. a1-10). The thoracic segments are frequently more robust than the abdominal segments, while the tenth abdominal segment is quite different in shape from the others.

The thorax, while apparently consisting of three parts, is in reality a compound of four. The microthorax (Figs. 1 and 27, mc), the so-called neck, which is the segment bearing the labium, forms the cephalic part of the first segment of the true thorax. The folds of cuticle between the head and thorax conceal the microthorax for the most part, it shows as a darker colored V-shaped area along the cephalic part of the ventral margin of the lateral aspect of the prothorax and is closely associated at its cephalic end with the labium. Similar V-shaped areas are found in practically all tenthredinoid larvæ, as *Croesus, Pteranus, Lygæonematus, Abia,* and *Lophyrus.* This area is reduced to a protuberance in *Cimbex,* to a slight brownish mark in *Cephus,* and is completely wanting in *Tremex.* (Fig. 10). In larvæ containing black or fuscous markings, this area of the microthorax (Fig. 27, mc) is almost invariably so marked.

The three sub-regions of the thorax can usually be identified by the presence of thoracic legs. This is true in the Xyelidæ, Pamphiliidæ, and Tenthredinidæ. In the remaining families the thoracic legs are generally represented by short, unsegmented stubs or swellings (Fig. 10, tl). The mesothorax and metathorax are similar in form, the prothorax resembles them closely, but in many species, particularly among the Tenthredinidæ, the thorax is greater in diameter than the head, and the dorsal portion of the prothorax is declivous. Among most larvæ other than the Tenthredinoidea, it is quite characteristic for them to have a transverse plate on the dorsal aspect of the prothorax and sometimes even on the other subdivisions of the thorax, such a chitinized plate or dorsal shield is found in the Tenthredinoidea only in the family Pamphiliidæ (Fig. 1, d), where it appears to be characteristic of all the species. In some species this plate is divided into three parts. The segments of the abdomen as already indicated are quite similar in form to each other except the tenth (Figs. 1, and 27), which will be discussed more fully later.

The external openings of the respiratory system, the spiracles (Fig. 1, s), are usually distinct and frequently surrounded by a different color from the adjacent parts of the body. There is a pair of spiracles on the prothorax, located near its caudal part in *Pamphilius,* and near the middle of the segment in the Tenthredinidæ (Fig. 27). These spiracles are morphologically the mesothoracic spiracles, which have migrated from their position between the segments on to the prothorax. They

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are usually the largest spiracles on the body. There is a pair of rudimentary spiracles between the mesothorax and metathorax (Fig. 1). The presence of these spiracles is of interest, they are open spiracles in the nymphs of insects with an incomplete metamorphosis so far as observed, rudimentary or wanting in the larvæ of insects with a complete metamorphosis, but large and prominent and open in many of their adults. These rudimentary spiracles have been found in all the larvæ examined, they can be identified as minute brownish spots in line with the other spiracles. The abdomen bears a pair of spiracles on segments one to eight. The spiracles on the first abdominal segment may be as large as the spiracles located on the prothorax or only half their size, they are usually larger than the spiracles on segments two to seven. The spiracles on the eighth segment are usually larger than those on segments one to seven, frequently twice as large and sometimes as large as the spiracles on the prothorax. The spiracles are usually all of the same color and frequently surrounded by a triangular black or fuscous mark as in (Fig. 6, s) *Cimbex.*

The thoracic legs (Figs. 1, and 27) are fleshy and robust at their proximal ends, slender and pointed at their distal ends. The coxa or proximal segment constitutes the largest part of the leg, not only in length but in width. In the Tenthredinidæ the coxa is divided longitudinally by a suture into two parts the edges of the suture and the proximal part of the coxa are frequently of a different color from the adjacent parts, so that the legs appear to be marked by a brownish or fuscous Y. The trochanter is a short narrow ring in the Pamphiliidæ, but is hardly indicated in the Tenthredinidæ. The femora and tibiæ are sub-equal in length to the trochanter in the Pamphiliidæ, though smaller in diameter, but in the Tenthredinidæ the femur is considerable longer than the tibia and much longer than the trochanter. The tarsus and claws of each leg are fused and but little if any longer than the tibia. The claw is hooked at apex. Many of the species which cling to the edge of the leaf with the thoracic legs, have their legs black, except at the joints.

Abdominal legs or prolegs (Fig. 27, pl) are present in the families Xyelidæ and Tenthredinidæ. They are fleshy protuberances and differ from the prolegs of lepidopterous larvae in that they lack the circlet of terminal hooks. In the Xyelidæ the prolegs are small and there is a pair on each segment. The most of the sub-families of Tenthredinidæ have prolegs present on segments two to eight and ten. In the Nematinæ, Hoplocampinæ, and Acordulercerinæ the prolegs are large and placed on segments two to seven and ten, while in the Hylotominæ they are placed on segments two to six and ten. In the Nematinæ and Hoplocampinæ the prolegs are placed along the lateral part of the ventral aspect of the segments while in the Acorduleceriné they are minute tubercles placed close together adjacent to the meson. In *Phlebatrophia,* which is a leaf-miner, there is a pair of protuberances on each thoracic segment between the thoracic legs in line with the abdominal prolegs. In those groups where the prolegs are present, they differ from lepidopterous larvæ in that they always have a pair of prolegs on the second abdominal segment. The prolegs are generally of the same color as the ground color of the body; in some species there is a round, black spot, pad-like, on the cephalic side of each proleg. In some black larvæ, as *Pteronus ventralis,* the prolegs are white.

The prolegs of the tenth abdominal segment, the anal prolegs, are usually larger than the others, longer and broader, and comprise the greater part of the tenth segment (Fig. 27). In the larvæ of certain species of the genus *Pachynem-*

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atus and *Pteronus*, the caudal third of the abdomen is narrowed and bluntly pointed, the prolegs of the tenth segment are correspondingly reduced or rudimentary.

In the Pamphiliidæ the tenth abdominal segment bears on each side a distinctly segmented appendage, an anal cercus (Fig. 1, ac). These appendages are not segmented in any other group of the superfamily and never so large. In a number of genera, though not characteristic for the genus, there is a pair of pointed projections, which have been homologized with the anal cerci (Figs. 27, and 11, ac). They are of more frequent occurrence in the Nematinæ than in any other subfamily of the Tenthredinidæ. They are also present in the cephids and in *Tremex*.

There is a distinctly chitinized dorsal plate on the tenth segment in the Pampiliidæ (Fig. 1, a10), which is wanting in all the other groups. In the boring larvæ the tenth segment bears a fleshy or chitinized mesal spine (Fig. 11). The anal opening is a transverse slit located along the dorsal part of the anal prolegs and its lips usually bear transverse rows of fine setae. In certain species where the larvæ are opaque white or green in color, the centre of the dorsal aspect of the tenth segment bears a fuscous or black spot. This is of freqnent occurrence in those larvæ that curl themselves helix-like on the underside of a leaf. The black spot is placed eye-like in the centre of the coil.

Each abdominal and thoracic segment is crossed by transverse lines. These lines are interrupted in the region of the spiracles so that the dorsal and ventral lines are not continuous. There is also generally a difference between the thoracic and abdominal segments in the number of these depressed lines. These lines divide the surface of the segments into elevated ridges. These ridges are known as annulets (Fig. 6, and 1-7). The number of annulets is constant for each species. In inflated specimens that are abnormally inflated and in specimens that are dropped directly into alcohol and shrunken, they are difficult to identify, but in living specimens and carefully prepared specimens they are easily followed and undoubtedly will prove of great service in the classification of these larvæ.

If the condition found in the Pamphiliidæ may be assumed to be the generalized condition, the primitive number of annulets would be four (Fig. 1), since the larvæ of this family have that number on both the dorsum and the venter. The ventral annulets of the Pamphiliidæ are as well marked as the dorsal, but in the groups bearing prolegs the ventral annulets are greatly reduced (Figs. 7, 8, and 12). The ventral annulets are usually difficult to identify in the Tenthredinidæ and are rarely more than three. While in some species the number of thoracic annulets is the same as the abdominal, as a rule there is a difference; in the great majority of the species the primitive number of four is retained, but in some species there may be more than four, and in others less. The usual number of annulets on the dorsum of the abdominal segments is six, as in the Emphytinæ (Fig. 12), Selandriinæ, and Lophyrinæ. This number has probably arisen from the primitive four by a subdivision of the second and third. The maximum number is found in *Cimbex* (Fig. 6), and *Trichiosoma*, where the number is seven: the minimum number is found in the Acordulecerinæ, so far as observed, where there are three. In the Pamphiliidæ, as already indicated, there are no annulets on the tenth segment and they are frequently wanting in the larvæ of the Tenthredinidæ (Fig. 27).

The annulets of the dorsal and ventral surfaces are not continuous, as already indicated, but interrupted in the region of the spiracles. In the Pamphiliidæ there is an elevated longitudinal fold extending the length of the segment just below the spiracle, which has been designated the spiracular area (Fig. 1, sa). This

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area is also distinct in the Tenthredinidæ (Figs. 6-8 and 12, sa). There is also an area that is marked in certain larvæ, which is located above the spiracular area and behind the spiracle and appears to be formed from the fourth and sixth annulets. This has been designated the postspiracular area (Figs. 6-8, 12 and 27, pa). There is a third area, which is located between the base of the proleg and the spiracular area, the pedal area (p). This area varies considerably, even in the same insect; on some segments it may be a single area and on others divided into two (Fig. 27, p).

The body, comprising the thorax and the abdomen, may be either black, white, green, spotted or banded. The great majority of the larvæ are white or green. In the green larvæ the color is due in great part to the blood or the food contained in the alimentary canal. In such larvæ the dorsal vessel or heart also usually shows as a darker median band. The air tubes or tracheæ along the lateral margins of the dorsal vessel and along the lateral aspect of the body and connecting the spiracles, show as silvery or frosted lines, either one or both of these may be obscured. In a few species there is a double row of dorsal yellow spots in certain Nematinæ and a lateral row of similar spots on the postspiracular area of certain segments. These yellow spots are due to the presence of patches of yellow adipose tissue or fat, which can be seen through the transparent cuticle. Markings due to the food, the colour of the blood, the air-tubes, or the adipose tissue are serviceable in separating different species, but unfortunately they disappear wholly or in part when the larvæ are preserved in alcohol. Frequently, however, an entirely new set of colour characters appear, due to the preservative fluid.

Many species of larvæ are marked by bands or spots of varying degrees of prominence, which are due to pigmented colours. The median dorsal black line of *Cimbex* is such a color, a median black line is usual for the group and is characteristic for the genus. When pigmented dorsal bands are present, they are usually located one on each side of the dorsal vessel. There is also frequently a band on each side along the line where the dorsal and lateral aspects meet. These lines are continuous with the fuscous bands found on the vertical furrows. The bands, while appearing continuous to the unaided eye, are seen, when examined with a lens, to be a series of spots interrupted by the crossing of the furrows between the annulets. There are frequently interrupted bands on the pleural aspect formed by a series of spots on the spiracular and pedal areas (Fig. 27).

The thoracic and abdominal segments of most of the larvæ examined bear setæ (Figs. 6-8, 12, and 27). The arrangement of these setæ, as groups of setæ, not as individual setæ, is characteristic for genera at least. In the Emphytinæ, certain Selandriinæ, and Tenthredininæ, the setæ are fine and of the same colour as the body cuticle (Fig. 12), consequently inconspicuous and readily overlooked. They are arranged in transverse bands and are usually placed on the first and third annulets or the first, third, and sixth annulets. There are also longitudinal bands on the spiracular and pedal areas. In many Blennocampinæ (Fig. 8) the setæ are large and spine-like, bifurcate at apex. In some species of this subfamily the terminal bifurcate portion is wanting and they are represented by white protuberances or black spots. These larvæ during their ultimate stage, even the spiny species, have apparently naked bodies. The bifurcate spines are replaced by fine colourless setæ like those of the Emphytinæ. A different condition is found in certain Nematinæ and the Acorduleceriné, where the setæ are fine and colourless and difficult to locate in all the stages but the ultimate, where each seta is placed on a small black or fuscous spot, completely changing the appearance of the larva and distinctly marking the location of the setæ.

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In certain Nematinæ (Fig. 27) and the Hylotominæ (Fig. 7), the setæ are arranged in groups or singly on small elevated areas. The larvæ of *Pteronus ribesii* and of *Hylotoma* show the maximum type of the development of this form of maculation, where the spots bearing the setæ are arranged in transverse bands on the dorsal and lateral aspects of the annulets and in longitudinal spots on the areas adjacent to the spiracles. The number and size of these spots, which are black, give the larva a predominance of this colour. These black areas are constant in their location for a given annulet for successive segments for a given larva. This has been assumed by some writers to be the generalized type of maculation, but an examination of a series of species will show that it is an extreme type of specialization. In some nematids similar spots are found only on the thoracic segments, in others they may be limited to the dorsal aspect of the body or to the lateral aspect. The larva of *Croesus latitarsus*, which apparently has a somewhat similar type, is in reality entirely different. The individual spots in this species extend on to two or more annulets without regard to the setæ, while in *Pteronus ribesii* (Fig. 27) the setæ are all located on the spots, but in *Hylotoma* (Fig. 7) there is an abundance of setæ between the spots.

There is still another type of colouration, which is characteristic of a large number of larvæ of the Emphytinæ and Selandriinæ. These larvæ during the first two or three instars are opaque white in colour. The lateral aspects of the body in the region of the spiracles, as they age, becomes gradually infuscated. The venter, including the prolegs and a narrow band along the ventral margin of the lateral aspect, remains opaque white. This lateral infuscated band is only slightly indicated in the first stages of its appearance and in some species never gets any stronger throughout the life of the larva. But among other species all degrees of intensity occur, from a light brown to a chocolate brown and black. The median part of the dorsum is white in the infuscated species, but with the increase in intensity of the lateral bands, the dark colour suffuses over the entire dorsum and in the very dark species the pleura and dorsum are a uniform dark chocolate colour during the last instar. The larvæ which develop this type of colouration usually rest curled up on the underside of the leaf like a snail shell or helix. In the very dark coloured forms the white of the ventral surface is completely obscured, and the anal prolegs, which are white, are turned so as to be exposed and to form the apex of the helix and look like a white eye. Each seta is placed on a minute white spot; with the dark background they stand out distinctly.

The larvæ of certain Tenthredininæ have a similar type of colouration, but they differ from the Emphytinæ and Selandriinæ in that they have an ultimate stage. No matter what the colour during the preceding instars, they are immaculately glassy-green during the ultimate stage.

The Cladiinæ feed stretched out flat on the surface of the leaf. The adults have generally been assumed to be closely allied to the Nematinæ and usually associated with them. All the larvæ of this group that have been examined are entirely different in appearance from the nematids. They practically all have the same type of colouration described above for the emphytids and selandrids and during their last instars are highly coloured. Their resemblance to the Emphytinæ is enhanced by their flat body and method of feeding. They are also peculiar in having a great abundance of long setæ on the head as well as on the body segments.

In *Cimbex* and *Trichiosoma* the body is green or white, a median dorsal black line in *Cimbex*. The pleural part of the annulets and the areas adjacent to the spiracles bear a number of papilla-like elevations (Fig. 6), which are more prom-

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inent in *Cimbex*. The surface of the body in addition is densely covered with minute granulations in this genus, the setæ appear to be wanting on the dorsal aspect and are few and fine on the pleural aspect while in *Trichiosoma*, although they are small, they follow the ordinary arrangement described for the Emphytinæ. None of the large granulations bear setæ.

Several subfamilies of Tenthredinidæ have glands on the thorax or abdomen which open on the external surface of the body. These glands excrete a fluid which is used either for effecting the food plant or for protection.

The most striking of the protective glands are peculiar to the Cimbicinæ (Fig. 6, pg.). If the spiracles of abdominal segments two to eight are examined, a small round opening will be noted just above them. A watery fluid is poured from these openings; it is this fluid that makes the body of the larva wet when it is taken in the fingers. The larvæ are also able to throw this fluid in a jet for a distance of a foot or more; they feed exposed; rest curled up into a ring on the upper surface of the leaf. The ability to wet their bodies and to throw out this fluid in jets is undoubtedly a protection to them.

All the larvæ of the genus *Caliroa* so far as examined have a pair of long, finger-like glands attached to the prothorax between the head and the prothoracic legs (Fig. 26 ph). They are longer and larger than the legs, so that in preserved specimens the larvæ look as if they had four pairs of thoracic legs. These larvæ are leaf skeletonizers, feeding on the under surface. They feed with these glands folded around the front of the head, much as one would fold their arms across their face. The ventral part of the head is completely concealed, and if a feeding larva is examined with a lens, it will be seen that the glands and mouth-parts are enveloped in a gelatinous substance like thin cherry-gum. This substance evidently influences in some way the surface of the leaf on which the insect is feeding. The glands are wanting in *Endelomyia* and, if present in *Phlebatrophia*, are not exserted at all times as in *Caliroa*.

In the larvæ of the Cladiinæ, Hoplocampinæ, and Nematinæ, there is on the ventral aspect of abdominal segments one to seven a single gland located on the meson. The mouths of these glands are located between and slightly behind the prolegs (Fig. 22). The transverse slit marking the position of the mouth is elevated and is readily identified in preserved specimens even if the glands are not extruded. The glands are retracted sacks like the osmateria of certain butterfly larvæ and are usually extruded when the larvæ are killed in hot water (Figs. 20-21). The extruded glands vary greatly in form from short ovate knobs to long club-shaped structures three or four times as long as broad. They are heart-shaped in *Lygaeonematus* (Fig. 23), and club-shaped in *Croesus* (Fig. 21). It has already been noted that the larvæ of the Cladiinæ rest flat on the surface of the leaf, likewise certain Hoplocampinæ, and a few Nematinæ. All the other larvæ of the Hoplocampinæ and Nematinæ are edge feeders. They grasp the edge of the leaf with the thoracic legs and rest with the abdomen stretched along its edge or slightly to one side, but ordinarily not clasping the edge of the leaf with the prolegs, or with the abdomen elevated and bent in the form of a letter S. If the food plant is jarred, the abdomen is thrown over until the dorsal surface of the abdomen either rests upon or is close to the dorsal surface of the thorax. The placing of the abdomen in this position brings the mouths of the ventral glands to the exterior and to the point where attack would be expected. If an ichneumon approaches such larvæ, the abdomen is waved back and forth through the air. The action

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of the larva in bringing the glands into prominence would suggest that a fluid or disagreeable odour was poured out from them. Although larvæ representing several species and genera were examined, no fluid or fetid odour was noted. It may, however, be a fetid odour perceptible only to insects.

The larvæ collected on sedge and believed to belong to the Dolerinæ have on abdominal segments one to seven a pair of deep oblique folds. These folds are located on the segments in line with and behind the prolegs. There has been no opportunity to study sections of these structures, and the mouths of the folds do not appear like the mouths of glands. It has been assumed that they were glands from the general occurrence along these folds of plate-like masses, which are striated, grayish in colour, and project downward for a considerable distance, and have all the characteristics of a glandular secretion.

After so full a discussion of the metamorphosis, anatomy and coloration of the larvæ, a word should probably be said in conclusion as to their classification. The larvæ are divisible into four types. The first three families, Xyelidæ, Pamphiliidæ, and Tenthredinidæ, represent three of these types. They have distinct thoracic legs, which would suggest some relationship. The two generalized families, Xyelidæ and Pamphiliidæ, are clearly the most primitive in their larval as well as in their adult characters, and like the adults would suggest that they have arisen along different lines. The Pamphiliidæ with distinctly segmented and long antennæ and segmented anal cerci are the more primitive so far as their larval structures are concerned. The lack of prolegs is difficult to explain. The Xyelidæ with inconspicuous antennæ and without segmented anal cerci are readily differentiated from the Pamphiliidæ, while the presence of prolegs on each abdominal segment would suggest a generalized condition entirely different from that found in the Pamphiliidæ. From the structure of their wings the Xyelidæ are unquestionably the most generalized, but from the structure of their larvæ the Pamphiliidæ are unquestionably the most generalized. The Tenthredinidæ suggest a stage of specialization from the Xyelidæ. They have a similar type of antenna, with a reduction in the number of prolegs. The general similarity of the habitus of the larvæ of the various subfamilies would suggest, like an examination of their wings, that they represented a single homogeneous group instead of several of higher rank. The Xiphydriidæ, Siricidæ, Cephidæ, and Oryssidæ are correlated together as adults, they should likewise be associated from larval characters. The most striking is the loss or reduction of the thoracic legs, the lack of prolegs, and the presence of a caudal cuticular horn. The antenna of *Cephus* is similar to that of the Nematinæ. Not enough is known regarding the larvæ of these later groups to offer anything as to the interrelation of the families.

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List of Abbreviations.

a 1-10..Abdominal segments one to ten.
ac.....Anal cercus.
an.....Annulets.
ap.....Antecoxal piece of the mandible.
apl....Anal proleg.
at.....Antenna.
as.....Antennal socket.
au.....Anus.
c......Clypeal suture.
c1.....First clypeus.
c2.....Second clypeus.
ch.....Caudal horn.
cr.....Cardo.
d......Dorsal shield.
e......Epicranial suture.
f......Front.
fc.....Fronto-clypeal suture.
g......Gena.
gd.....Gland.
gl.....Galea.
l......Labrum.
la.....Labial palpus.
lb.....Labium.
lg.....Ligula.
m.....Mandible.
mc....Microthorax.
me....Mentum.
mg. ..Mouth of gland.
mx....Maxillary palpus.
o......Ocellus.
oc.....Occiput.
of.....Occipital foramen.
ol.....Ocularum.
p......Pedal area.
pa.....Postspiracular area.
pf.....Palpifer.
pg.....Pleural gland.
ph.....Prothoracic gland.
pl.....Proleg.
ps.....Prothoracic spiracle.
pt.....Postgena.
s......Spiracle.
sa.....Spiracular area.
sb.....Submentum.
sp.....Spinneret.
st.....Stipes.
t1-3....Thoracic segments one to three.
ta.....Anterior arm of the tentorium.
td.....Dorsal arm of the tentorium.
tl.....Thoracic leg.
tp.....Posterior arm of the tentorium.
tn.....Tentorium.
tr.....Trochantin of the mandible.
v......Vertex.
vf.....Vertical furrow.
vg.....Ventral gland.

Explanation of Plate I.

1. *Pamphilius dentatus.* Lateral view of entire larva.
2. *Pamphilius dentatus.* Cephalic aspect of head.
3. *Cimbex americana.* Cephalic aspect of head.
4. *Pamphilius dentatus.* Caudal aspect of head.
5. *Cimbex americana.* Caudal aspect of head.
6. *Cimbex americana.* Lateral view of third abdominal segment.
7. *Hylotoma* sp. Lateral view of third abdominal segment.
8. *Periclista* sp. Lateral view of third abdominal segment.
9. *Pamphilius dentatus.* Ventral view of head.
10. *Tremex columba.* Head and prothorax.
11. *Tremex columba.* Abdominal segments nine and ten.
12. *Macremphytus varians.* Lateral view of third abdominal segment.
13. *Pamphilius dentatus.* Maxillae and labium.
14. *Trichiosoma triangulum.* Antenna.
15. *Hylotoma* sp. Antenna.
16. *Caliroa limacina.* Antenna.
17. *Cephus pygmaeus.* Antenna.
18. *Pristiphora bivittata.* Antenna.
19. *Lophyrus* sp. Antenna.
20. *Croesus latitarsus.* Ventral view, showing extruded ventral gland.
21. *Croesus latitarsus.* Laternal view of ventral gland, enlarged.
22. *Croesus latitarsus.* Ventral view, showing mouth of ventral gland.
23. *Lygaeonematus erichsonii.* Lateral view of ventral gland and proleg, enlarged.
24. *Lygaeonematus erichsonii.* Ventral view, showing extruded ventral gland.
25. *Macremphytus varians.* Ventral view of an abdominal segment where gland is wanting.
26. *Caliroa limacina.* Ventral view of head and thorax, showing prothoracic glands.
27. *Pteronus ribesii.* Lateral view of entire larva.

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ADAPTATION IN THE GALL MIDGES.

E. P. Felt, Albany, N.Y.

Adaptation is defined in the Century Dictionary as an "advantageous variation in animals or plants under changed conditions." This definition is sufficiently broad to include practically every modification resulting in a variation from what might be construed as the normal for a given family, tribe, genus, or even species. It is well known that every animal is exposed to numerous natural hazards during its life. Existing species must be equal to these perils or become extinct. It is convenient to group the forms of adaptation under their heads.

1. Strength, Aggressive and Defensive.—We can all recall forms which appear well-nigh invincible because of superior physical development—muscular or defensive. The lion and rattlesnake represent two familiar and diverse types belonging in this category. One is remarkable for its superior muscular development and the other possesses a peculiarly efficient means of defence.

2. Prolificacy.—There are numerous species with no particular physical efficiency. Some of these latter owe their existence largely to prolificacy. The common river shad, for example, may produce from 60,000 to 156,000 eggs, while a seventy-five pound cod may contain 9,100,000 ova. This extraordinary prolificacy is evidently a provision of nature to offset the numerous perils threatening the fry. Some of our plant lice attain the same end by producing a number of generations annually; for example, the common hop plant louse is capable of producing twelve generations in a season, the final progeny amounting to over ten sextillion. The increase in this latter species is by geometrical, not arithmetical progression.

3. Evasive Adaptations.—There are hosts of species which escape extinction by the exhibition of more or less cunning in avoiding the many natural perils. This may be the result of modifications in the biology, peculiarities in habit, specializations in structure, or even cryptic or other resemblances. We have sometimes wondered if these factors, physical development or strength, prolificacy and evasive adaptations would be assigned sufficiently exact values so if two were known the third could be ascertained.

* * * * *

The gall midges exhibit a most interesting condition. The approximately 800 American species known probably represent only one-third to one-fifth of our fauna. Some 450 species have been reared from 183 plant genera representing 65 plant families. The largest of the gall midges is only about one-fourth of an inch in length, while the smallest measures scarcely one-fiftieth of an inch. Local in habit, slow of flight, fragile in structure, and far from attaining an extraordinary prolificacy in many instances, how do these multitudinous species maintain themselves? Physical development, either aggressive or defensive, is hardly worth mentioning.

4. Biological Adaptations.—There are good reasons for believing that gall midges are allied to the fungus gnats or Mycetophilidæ, many of which live as larvæ in decaying organic matter. The inner bark of various trees in incipient decay may contain hosts of Miastor and Oligarces larvæ. These maggots are remarkable because they exhibit a modification of parthenogenesis known as pædo-

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genesis, an adaptation of inestimable value to species living under such conditions and dependent upon weakly organized adults for their establishment in favorable conditions. These midges produce only a few eggs and evidently possess very limited powers of flight. The larvæ are capable of penetrating only the weaker, semi-rotten tissues of bark and sapwood, and are preyed upon by voracious maggots

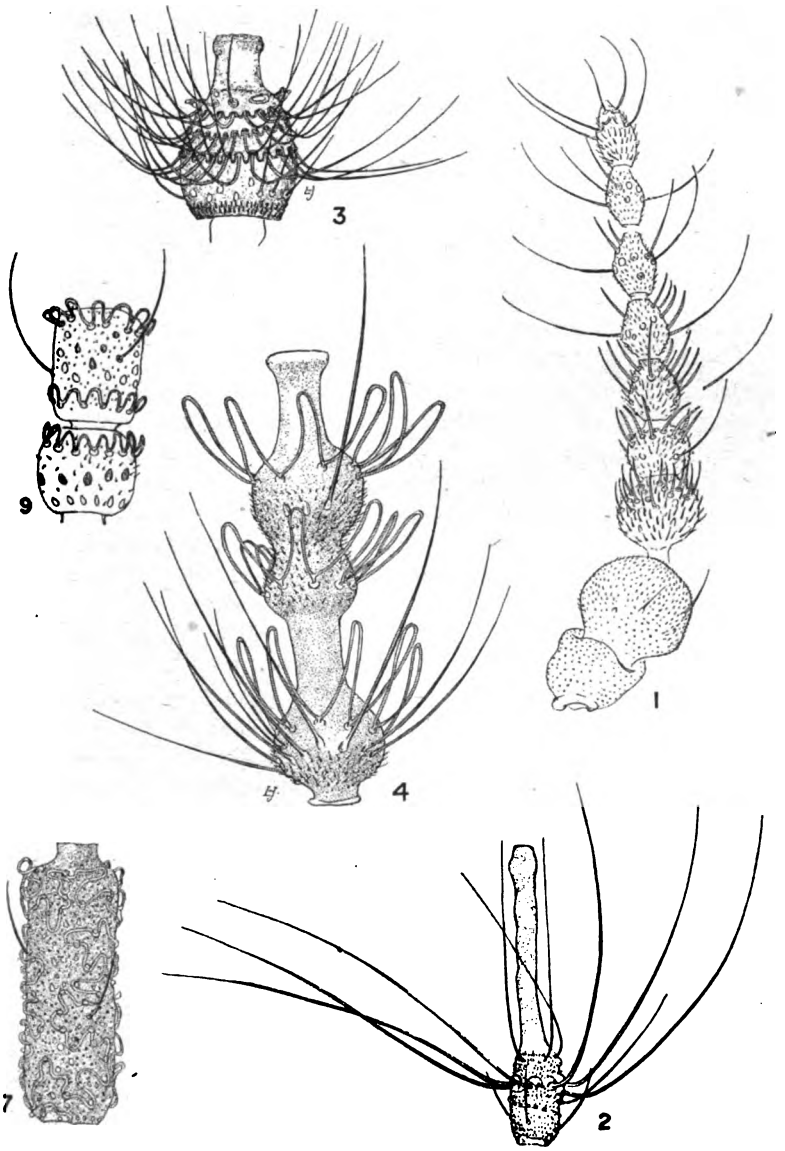

Fig. 3.—Gall Midge Structures.

belonging to the genera Medeterus, Lonchea and Lestodiplosis. All too frequently the only evidence of Miastor infestation is the abundance of predaceous maggots which have devoured practically every inhabitant of a once populous colony. The ability to produce young in an indefinite series of generations by maggots advancing in unoccupied tissue is a great advantage in avoiding such enemies as those men-

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tioned above. We also have in this series of pædogenetic generations an example of multiplication by geometrical progression such as obtains among our plant lice.

Certain species like the Hessian fly, sorghum midge, violet midge and rose midge depend for existence to a considerable extent upon the production of several generations annually; in other words, increase is by geometrical progression. The extraordinary efficiency of this form of adaptation is strikingly illustrated in plant lice as mentioned above. Such species, if able to subsist upon farm crops or other products valuable to man, are potentially serious pests. One generation annually appears to be the normal for many midges, and consequently the ability to produce more in a season must be considered a favorable adaptation to existing conditions.

Midge Galls.—Recalling the fact that the more ancient type of gall midges appear to be related to the fungus gnats or Mycetophilidæ, and that they furthermore exhibit similar preference in that the larvæ occur in organic matter in various stages of decay, one would expect to find a series of galls showing gradual modifications from this comparatively simple habitus to the more complex type of shelter so frequently observed in this group.

Bud Galls.—Possibly the simplest type of midge gall is to be seen in the irregular, loosely and variously developed bud galls produced by some species of Dasyneura and its allies. The eggs appear to be simply dropped among the developing floral organs or leaves, and the larvæ obtain their sustenance by absorbing nutriment from adjacent tissues. The weakening of these latter prevents normal development, and, in some instances at least, we have the conspicuous and rather characteristic rosette galls such as those of species of Rhopalomyia upon solidago and Rhabdophaga upon willow.

The growing point of a plant stem, whether it forms a leaf, bud, or a flower, affords such ideal conditions for nourishment that it is not surprising that certain genera should be restricted in large measure to such a favorable habitus. This is particularly well marked in Asphondylia and certain of its allies which not only confine themselves largely to bud galls, but have become so specialized that they are particularly adapted to the production of such deformities.

Leaf Galls.—The leaf gall, like the bud gall, usually begins as a development upon expanding or tender tissues. The simplest type is probably a marginal leaf roll, and this differs from certain of the loose bud galls simply by the fact that in the roll only a portion of the leaf is involved, while in the bud gall all or several leaves may be distorted or have their development arrested. Vein folds are produced simply by the larvæ congregating or restricting their operations to this portion of the leaf rather than to the margin. They vary greatly in character and may be limited to the midvein or to the lateral veins, may be comparatively simple and composed of greatly hypertrophied tissue or ornamented with a conspicuous white pile or other development such as is found in that of *Cecidomyia niveipila* O.S. These leaf rolls and vein folds are usually produced by a number or small colony of larvæ. Blister leaf galls and the more highly developed globular or conical galls are generally produced by single larvæ hatching from eggs deposited in or upon the buds before the leaves have unfolded. The peculiar blister galls on solidago and aster are multiocular, are easily recognized by the typical discoloration and thickening of the leaf and are produced almost without exception by the genus Asteromyia. These galls represent a slightly more advanced condition than obtains in certain species which live between the upper and lower

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epidermis and either produce only a slight discoloration as in certain species of the genus Cincticornia, or else excavate a fairly well defined mine such as that of *Lasioptera excavata* in Crataegus. The globular or lobulate galls of *Cincticornia globosa* and *C. pilulæ* respectively, as well as the conical and globose enlargements of various species of Caryomyia upon hickory must be considered as extreme types or modifications of the blister gall.

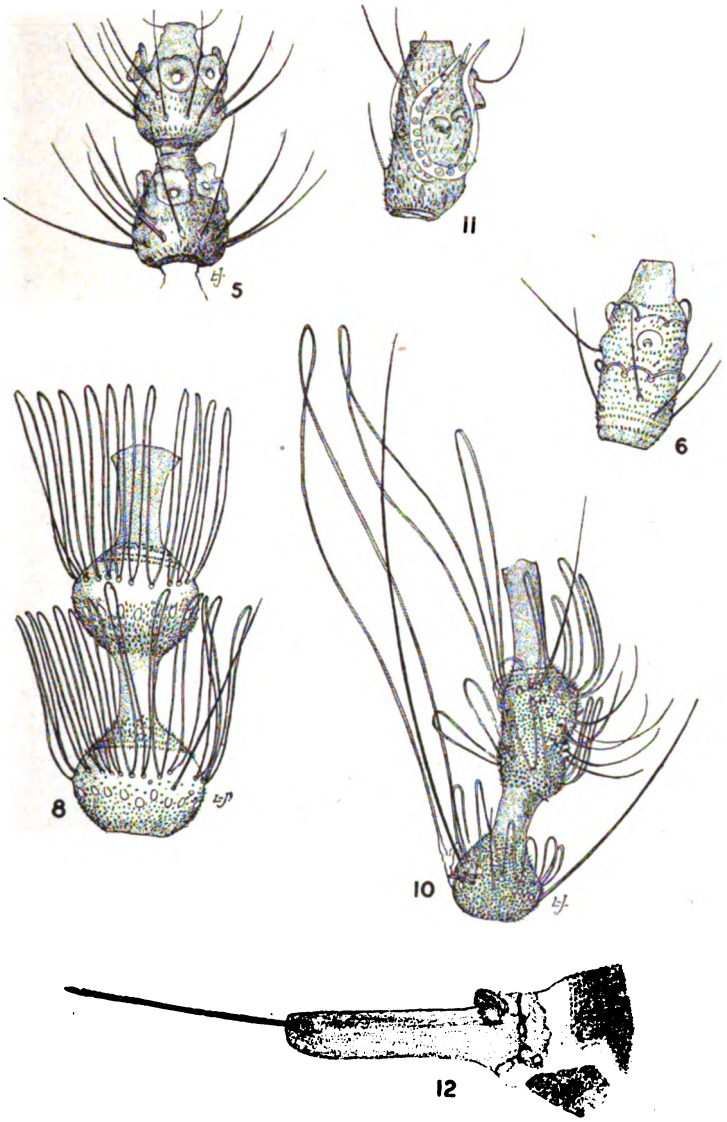

Fig. 4.—Gall Midge Structures.

Stem Galls.—No part of the plant is exempt from infestation by the small representatives of this large family, be it seed, flower, leaf, stem or root. The stem gall is usually subcortical, and in those produced by midges, development generally begins while the tissues are still in a soft and plastic condition. They are usually polythalamous and are frequently irregular, more or less confluent swellings in the bark.

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The medullary, stem or branch galls differ from the preceding in that the larvæ confine their operations to the interior of the affected tissues, frequently restricting themselves to the pith and producing rather characteristic deformities.

Root Galls.—There are only a few root galls known, probably because of the great difficulty in finding them. There appears to be no marked difference between these and stem galls, aside from the point of location.

Recalling the fact that gall midge larvæ are small, without defensive armor or apparatus, with masticatory or boring organs poorly developed or absent, it is obvious that this gall-making habit is one of the most important adaptations of the family. The gall midges have been able to maintain themselves in hosts and in many and varied forms by adaptations which have led to their seeking sustenance and shelter in places comparatively free from invasion by other insects. Not only have these small insects learned to prey upon numerous plants, but some have found it advantageous to wring sustenance from their associates. The species of Lestodiplosis, in particular, may be reared from a great variety of galls, and the larvæ have even been observed preying upon gall midge maggots, especially those of Miastor. Members of this family have also learned the value of other insects as food, and we now have records of a number of species preying upon scale insects, various plant lice and red spider.

Intimate relations exist between certain genera of gall midges and families and species of plants. It is perhaps sufficient to note in this connection that the genus Cincticornia is practically confined to Quercus, Caryomyia to Carya, Rhopalomyia largely to solidago and aster, and Rhabdophaga mostly to Salix. The mere statement of these facts indicates a correlation which has been discussed more fully by the speaker elsewhere and need not be dealt upon at the present time.

5. Structural Adaptations.—It might be thought that this host of gall midges with its general similarity of habit would exhibit comparatively slight variations in structure. Modifications in anatomy almost invariably mean variations in habits, and consequently they are worthy of note, even though they be but signs of unknown facts, in the same way that irregularities in the movement of a celestial body may mean the existence of an unknown planet. We wish for a few minutes to call attention to some of the more striking structural modifications.

Antennæ.—The antennæ in this family present a most extraordinary range in development, varying from comparatively insignificant and presumably relatively useless organs with but eight segments in Tritozyga and Microcerata to the rather highly specialized organs with as many as 33 segments in *Lasioptera querciperda*. There is an equally great variation in the form of the antennal segments and their sensory organs. The cylindric antennal segment is undoubtedly the more generalized type, and is the one found most frequently in the Mycetophilidæ. This may be modified to form a cylindrical larger base and a greatly produced distal stem, in some instances the latter attaining a length three times that of the basal enlargement. The basal portion of the antennal segment may be conical, as in many Campylomyzariæ, or globose as in Joannisia, while in the Itonididinariæ we have a dumb-bell-shaped structure, the basal and distal enlargements being separated by a stem, with a similar constriction at the apex of the segment. This peculiar modification undoubtedly means greater efficiency in the sensory organs, since they are more widely separated, and is characteristic of the males in one large tribe.

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The antennæ of the more primitive groups such as the Campylomyzariæ and the Heteropezinæ bear a number of peculiar sensory organs, the more remarkable of which are the so-called stemmed disks in the genus Monardia. These are probably olfactory in function.

The Itonididinæ, as limited by us, may be easily recognized by the presence of peculiar, colorless, threadlike, homogeneous, chitinous structures which we have named circumfili because they invariably run round the segment. They originate or arise from the interior of the segments, are presumably auditory in nature, and are discussed by Europeans under the names of arched filaments (verticili arcuata and filets arques) and bow whorls (Bogenwirtel), since these common names aptly describe the structures as seen in the males. These organs in the females generally form a slender girdle near the base and distal portion of the enlargement on the flagellate antennal segments, the two being connected by one or two longitudinal threads. In the males the development may be very diverse. In the case of the male Asphondylia the circumfili consist of a more or less variable series of extremely tortuous, slightly elevated threads reaching from the base to the apex of the segment. In the Itonididinariæ the circumfili of the male are frequently prolonged into a series of bow-like loops girdling the basal and apical enlargements of the antennæ; one on each in the bifili and in the trifili with two on the distal enlargement. The loops of the circumfili or bow whorls may be simply conspicuous sinuosities as in Caryomyia, or greatly prolonged on one side and having a length equal that of the entire segment as obtains in Aphidoletes and Bremia. A unique form of circumfili occurs in the genus Winnertzia. Here these structures greatly resemble minute, horseshoe-like appendages, one on each face of the segment, the produced free ends extending beyond the apex of the enlargement, while the supporting vertical threads give the appearance of a series of nails.

The peculiar circumfili, quite distinct in structure from auditory hetæ, suggest our latest means of communication, the much vaunted "wireless," and present distinct analogies thereto. Both respond to impulses conveyed through the air. It is possible the circumfili are "tuned" to vibrations unrecognizable with our finest instruments, and while the devices of men may convey signals several thousand miles, there is no reason for thinking that these unique antennal structures are relatively less efficient.

Palpi.—The normal number of palpal segments appears to be four, though these organs may become greatly reduced in any one of the tribes and in one genus, Oligarces, appear to be wanting. The development of these organs affords a good systematic character, and is correlated, in certain instances at least, with important modifications in habit.

Wings.—The organs of flight are of great value in taxonomic work and, in this family, present satisfactory characters for the delimitation of subfamilies and tribes. There is a cross-vein connecting subcosta and the third vein which occurs in a well-developed condition in the Lestremiinæ and the Epidosariæ, it being rudimentary or absent in the other groups except certain Heteropezinæ. The presence of the fourth vein is limited to the Lestremiinæ, in which subfamily it may be either forked or simple. The fifth vein also presents important modifications in that it may be simple, in which case there is frequently a sixth vein or forked, in which latter instance the sixth has become partly fused with the fifth. Certain genera in the Heteropezinæ are remarkable because of the weak wings and greatly reduced venation.

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Tarsi.—The normal number of segments is five, members of the Itonididinæ invariably having the first segment greatly reduced. Certain genera of the Heteropezinæ have four, others three, and in Oligarces there are but two tarsal segments. The claws may be simple, pectinate or dentate. They vary greatly in development and the same is true of the pulvilli.

There are other structures presenting equally significant modifications. This is particularly true of the generative organs and is especially well shown in the modified ovipositor which reaches an extreme development in the needle-shaped organ of Asphondylia, an instrument evidently designed for the piercing of thick bud tissues so that the egg may be deposited close to the growing point and in a place where conditions are most favorable for the development of the young.

It will be seen from the foregoing that the gall midges can not be counted as particularly strong or prolific forms, yet they have been able to maintain themselves largely by what we term evasive adaptations, which have resulted in their securing a very large degree of protection at the expense of the host plant. This summary is not intended to exhaust the subject, but is presented for the purpose of calling attention to a group exhibiting numerous unsolved and exceedingly interesting biological and morphological problems. There is, perhaps, no insect family better suited for the study of adaptation in numerous ways than the gall midges, a large group which up to recent years has been almost ignored by students.

EXPLANATION OF FIGS. 3 AND 4.

1. Antenna of *Microcerata spinosa*, male, showing 9 short segments. This organ is shorter in this species than the palp.

2. Sixth antennal segment of *Colpodia diervillae*, male. Note the greatly produced distal stem.

3. Fourth antennal segment of *Prionellus graminæ*, male, showing the conical shape and the peculiar whorls of long setæ arising from distinct crenulate chitinous ridges.

4. Fifth antennal segment of *Karschomyia viburni*, male, showing a binodose, almost trinondose structure of the segment and the peculiar circumfili or bow whorls.

5. Seventh and eighth antennal segments of *Monardia toxicodendri*, female, showing the general shape of the segments and the characteristic stemmed disks.

6. Fifth antennal segment of a *Rhopalomyia*, female, showing the generalized type of segment and the low circumfili commonly occurring in the female Itonididinariae.

7. Sixth antennal segment of *Asphondylia monacha*, male, showing the low, very tortuous character of the circumfili.

8. Fifth antennal segment of the pear midge, *Contarinia pyrivora*, male, showing the binodose character of the segment and the two well developed circumfili, the latter characteristic of the bifili.

9. Fifth antennal segment of *Caryomyia caryae*, male, showing the short though plainly sinuous circumfili, the three on a segment being characteristic of the trifili.

10. Fifth antennal segment of *Aphidoletes hamamelidis*, male, showing its binodose character, the three circumfili, and particularly the greatly produced loops and setae on the dorsal aspect.

11. Sixth antennal segment of *Winnertzia calciequina*, female, showing the peculiar horseshoe-like circumfili attached to opposite faces of the subcylindric segment.

12. Extended ovipositor of the nun midge, *Asphondylia monacha*, female, showing the basal pouch, the thick reversible basal portion of the ovipositor and the highly developed needle-like terminal part.

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CHRYSOMELIANS OF ONTARIO.

F. J. A. Morris, Port Hope, Ont.

The title of my paper may be misleading to some of you, and I should like at the outset to explain my attitude. It is simply that of a nature-lover led (more or less by accident) to collect some of the insects observed by him about trees, flowers and leaves, while roaming about the countryside with what Wordsworth calls "a heart that watches and receives."

Of technical knowledge I have little or none to offer, and my interest in the economics of Entomology is subject to prolonged fits of catalepsy; indeed. I doubt if it has ever shaken off this blanket of suspended animation sufficiently to appear in really stark-naked wide-awakeness. The fact is, an amateur collector is drawn chiefly by the giddy pleasure of the eye; most of the time he goes about craving new specimens, preferably those of large size and bright colour; he is an enthusiastic and irresponsible schoolboy, easily pleased, easily deceived. I knew a collector once in England,—I should have called him then, in my ignorance, an old man—he certainly had grey hairs in his head. He was a respectable married man and a regular church-goer, but alas, gentlemen, a lepidopterist in an advanced stage. He greatly coveted specimens of the swallow-tail butterfly. This is almost extinct in Great Britain, though still occasional in the fens of Cambridgeshire. The made-in-Germany kind that are exported from the continent to English dealers, ready set and pinned, did not satisfy him, and at last he was obliged to compromise matters by rearing some imported larvæ and liberating the imagoes in his back garden, in order to catch them again with his butterfly-net. Now what is that but childish make-believe? Unfortunately, most of us left this faculty of self-deception behind in the nursery, and are incapable of hoodwinking ourselves so easily. Yet I confess to a greater liking for my specimens of Asparagus Beetle since I took them on wild plants that were not growing in a garden, and I never really loved the Potato Bug and the Squash Beetles till I caught them on my side of the farmer's fence, the one feeding on the Bittersweet and the others on blossoms of the Goldenrod.

Moreover, were it not that such a consummation would jeopardize the existence of one of the world's lilies and eventually defeat its own end, I would sooner see every stalk of asparagus in my own as well as in all my neighbours' gardens devoured by either species of Crioceris (both, perhaps) than invent or discover an insecticide that should prove fatal to so pretty a beetle.

It is, I admit, bearding the lion in his den to appear before an audience largely composed of economic entomologists and talk from so alien a point of view as this about the Chrysomelidae of all insects in the world; for in the whole order of Coleoptera this is probably the one family that most violently flaunts its existence before the public eye, by its invasion of the kitchen garden.

Is there such a thing as a beetle-fancier, I wonder? If there is, that's what I am; and to show you that I have the courage of my opinions, I invite you all as fellow-members of this Society or as guests interested in insects to join me in a cross-country tramp north of Port Hope on a fine day about the middle of July. We shall start from our honored President's old home of Trinity College School, and in order thoroughly to enjoy the day I'll ask each of you for a little while to fancy yourselves back at school once more. Throw away the burden of years and

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the cares of a responsible position; drop the handle from your name, college degree and the rest of it; forget it all. What you want is a little zest for the day's captures, and (as we shall be out all day) a sandwich or two in your pocket against the noontide hour.

We have green lanes and fields right at our door, but as our road will in any case be a long one, we shall condescend to get a lift by boarding the morning train for Peterborough and riding as far as Quay's Crossing, 5 miles up the track. I am giving myself as well as you a treat, for this is a favorite walk, and I may not have many more opportunities of taking it. But for all the hundreds of times that I have trodden these paths and roamed the woods and fields, I do not think I have ever come out entirely or even primarily as a Coleopterist. The countryside all means far more than beetles to me, so I must ask you to pardon the digressions, which may be many; I hope they will not weary you.

During the few minutes of our train ride let us briefly review the family of Chrysomelians. There are no less than 18,000 species of these leaf-eating beetles known in the world; the vast majority are tropical; North America can claim only about 1-25th of this amount and Ontario about 1-70th. But even Ontario's share, nearly 300 species, makes a long list, the mere detailing of which would take some pages, while anything like systematic treatment, with specific or even generic description, would require a volume; it would, besides, be more than tedious,—it would be deadly dull. Henshaw's check-list makes about as inspiring reading as the least inspired of Walt Whitman's poems, and for the same reason—it's a mere catalogue. There are purple patches, I grant you, and not a few, in Le Conte and Horn or in Blatchley as there are in Professor Wickham's papers on the Chrysomelidae of Ontario and Quebec (contained in volumes 28 and 29 of the *Canadian Entomologist,* 1896-7). What are these purple patches of interest?—these oases in a desert of dry description? At first sight they seem of varying nature; sometimes a brilliant generalization or an ingenious analogy; at others a quaint observation of habits or a personal experience. But they all resolve themselves, at last, into the personality of the writer; it is the personal element that lends interest to a book or a paper on a technical subject; it is just this that makes the old-fashioned Lexicon of Samuel Johnson or Noah Webster an enthralling romance beside a modern dry-as-dust scientific work-of-a-syndicate like the Standard Dictionary.

It would obviously be impossible to write an interesting account of 264 species of beetles or even of 96 genera, but for the convenience of systematic treatment, this enormous mass of individuals, countless as the sands of the sea, has been marshalled, like the children of Israel, into twelve tribes and every one of these tribes has several representatives in Ontario. In our day's tramp we shall run across at least one representative of each tribe from Reuben the first-born to little Benjamin our ruler; in plain terms, from *Donacia,* the Reed beetle, cousin german to the more ancient Cerambycidae, to *Chelymorpha* and *Coptocycla* the little Tortoise. Of these twelve tribes, the most numerous in boreal America as well as the most important are the five numbered VI-X. These comprise more than 450 species out of a total (to the family) of less than 600 and more than 70 genera in a total of about 100; i.e., three-quarters of the entire genera and species belong to five consecutive tribes out of the twelve. Of these five tribes again, two are supreme, the 9th and 10th, included by LeConte and Horn in the single tribe of Galerucini or Helmet-grub beetles, with a total of more than 200 species and over forty genera, i.e., nearly half the family.

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In the tropics, where vegetation is most luxuriant, these beetles play an important part in checking the too-lavish growth, but in the Temperate zone where civilized man has brought the earth under cultivation, these twelve tribes, the chosen people of my paper, are nothing better than one of the plagues of Egypt, a most destructive pest, and man's best wits are taxed to prevent an annual loss of many million dollars.

The Chrysomelians represent a later development than the Cerambycidae or wood-borers, and their adaptation to succulent herbage and the deciduous foliage of flowering plants *pari-passu* with changes in the vegetable kingdom from sporophytes and gymnosperms, presents in its way as wonderful an illustration of adaptive development as more specific examples such as the symbiosis which has isolated the Yucca and its moth from all creation, till each depends on the other for its very existence and on the other only.

The larvæ of the Chrysomelians are in general soft and helpless; feeding as they do in the open and gregariously, they are easily destroyed, but several factors contribute to their notable success in the struggle for existence: their immense numbers, the rapidity of their growth (which enables them to produce more than one brood in a season); and the ability of the mature insect, in most cases, to hibernate.

A few of them retain traces of an earlier condition in being stem-borers, or in tapping the roots of plants, as the Donacias; and it may be a sort of atavism that impels Cryptocephalus and Glyptoscelis to resort to the needles and bark of white pine.

Our train is now slowing down to let us off at Quay's Crossing, and for the rest of the day we will have to put our best foot forward, for it is going to be shank's mare with us. First we go a quarter of a mile east to Mose Robinson's mill-pond and Pine Grove School-house. Just after crossing the stream here we turn south down a grassy lane, flanked on the west by an old snake fence and on the east by a still more ancient stump-fence; the snake fence appears to spring from a bed of oak-fern and brittle bladder. The lane is filled with sweet-briar and the stump fence festooned with wild grape-vine; a fortnight ago the briar and grape-vine were both in bloom and the lane was redolent with two of the most delicious scents on earth. A little way on at the foot of a sandy slope we cross a tiny brook of lovely, cool spring water, its surface mantled with water-cress. Here in the early season, as early as April, are nearly always to be found about the grass-blades, some specimens of the Donacia. This is our representative of Tribe I, a small tribe generically, consisting of two members only; the genus Haemonia has only one species, but the Donacia (Reed beetle, as the Greek name implies) has more than twenty species in North America. The kind I have found here is much like a Longicorn, and in early days was mistaken by me for a member of that family; it differs from the Chrysomelians in being long and narrow in shape, usually yellowish-brown in colour and of a metallic lustre. The larva feeds about the roots and bases of aquatic plants, and has acquired the power of living under water by tapping the air-vessels of its food-plant. It has actually a small process on the body which it uses as a probe. When about to pupate it encloses itself in an air-tight cocoon which is fastened to the root or stems of the food-plant beneath the surface. The beetle is covered on the under side with a pubescence that acts as a perfect protection, shedding the water like oilskin. The species found here in the cool days of April is more or less cylindrical (convex on the upper side) and quite sluggish in habit, but the *Donacia* of the dog-days in the height of summer is

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a very different creature. I well remember during my first visit to the Algonquin Park how one day I went over with the late Dr. Brodie to the little land-locked Cranberry Lake in the heart of the hardwood forests. It was a glaring hot day, with the sun at its height and perfectly calm. We rowed a boat down to the cranberry marsh at the foot of the lake, where all sorts of botanical treasures awaited us. On the way we passed through a patch of water-lilies and flushed a covey of Donacias; there must have been hundreds, leaping and flying from the lily-pads, striking the sides of the boat, and alighting sometimes in the water, occasionally on our clothes, darting and glittering in the sun like sparks from the molten surface of the cauldron of heat formed by this woodland lake at high noon beneath an August sun. The activity of movement and extraordinary vitality in the sun's heat are not common among the Chrysomelians, but they are among some of the Longicorns, with which the Donacias have a close affinity. Lords, for the nonce, of all three elements, earth, air and water, they moved easily about all three, perfectly at home and at their ease. On cooler days or when the breeze blows, they love to sit on their beloved lily-pads, like miniature batrachians, their thorax and head partly raised and their antennae thrust forward alertly, something like the asparagus beetle when it scents danger.

We shall now stroll south about a mile, along the edge of a wood we call the North Wood, a wood sacred by many memories, rich in flowers, the home of some rare orchids, in and about which I have found more than twenty species of ferns and a wide range of warblers and other birds at the spring migration; it is, besides, the scene of many of my best captures among the Coleoptera. Ten minutes' walk brings us to where the wood narrows close to a division fence, running west across meadow-lands to the railway. Just here stands on the edge of the wood a hawthorn, whose blossom for some reason or other has proved a beetle-trap or bait for an extraordinary number of species. It was on this blossom that I first captured specimens of the *Orsodacna*, our representative of Tribe II, and on the top-rail of the snake fence beside it, I took one of the few specimens I have ever seen of *Syneta*, another of the four genera contained in this tribe. The *Orsodacna* (or Bud-gnawer) is said by Blatchley to feed on willow blossoms, and this season as early as April I was on the look-out for it about clumps of willows in bloom, but the only thing new to me that I observed was a small moth dancing up and down in lively zig-zag flight over the willow-bushes; it was almost as small as a clothes-moth, blackish with a cream or white bar near the apex of the wing. From its extremely long hair-like antennae, I should judge it a species of Adela. We have but one species of *Orsodacna* and I have always found it on hawthorn, twice in great numbers, once here and once at Lakefield. The specific name is *atra* (black) but it is very variable and specimens sent by me to Guelph, taken all at the same time off this hawthorn bush some years ago were returned labelled under no less than four varietal forms. The pigmentation of the *elytra*, normally black, becomes less heavy and the wing-covers show light brown with darker disks and markings. In some of its forms the blend of colours is very pretty; the beetle is narrow-oblong and the texture of its upper surface is of an oily smoothness.

Let us cross the meadow west to the railway track; near the fence that extend from the hawthorn tree to the railway, on the south side are some sand-drifts where I have captured no less than six species of Tiger-beetle at various times in the season. The meadow to the north is less sandy and springs ooze out from its surface and meander over the grassy slopes; here in September the meadow is white and fragrant with *Spiranthes cernua*, the nodding Ladies' Tresses, one of our

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autumn orchids. Just where we strike the railway is an immense patch of that rather rare plant the Grass of Parnassus, whose green-veined creamy white blossoms in August and September make as brave a show as the Anemone in June and July. It is a sure sign of springs in the soil and further south there are traces of an old sphagnum moss swamp; though it is years since the railway hacked away the trees and shrubs, marsh pyrola and the showy Ladies' Slipper annually rear their upright stalks and unfold their blossoms for gauze-winged visitors to gather nectar from beneath the July sun.

Here, along the right of way, grows wild Asparagus, and on it you will find at least one species of the Asparagus beetle, which we shall take to stand for Tribe III. The first specimens I ever saw of this beetle were in a Kentish garden; they belonged to the species commonly known as the striped Asparagus beetle, and at first I did not recognize the insect; all I had by way of guide was an old book of Stevens with colored illustrations that were several times magnified. The picture showed a gorgeous insect, in rich dark green and cream hues, which to my excited imagination must be nearly as large as a June Bug. I found, however, to do the old naturalist justice, that though in the dead insect the sutural stripe, the basal marks and the cross-bar on the elytra appear black on a ground color of opaque straw-yellow, in life these colours are a rich, vivid, dark green on a ground colour of translucent cream, extremely beautiful when scanned with a lens. The 12-spotted species which seems the commoner in Ontario and is apparently more hardy I first found in the late Dr. Brodie's back garden in Toronto. Until five or six years ago neither species had made its way to Port Hope, but the spotted one appeared in several gardens then, followed a season or two later by the striped, and two seasons ago I first found the *Crioceris duodecimpunctata* on wild Asparagus. There is only one other genus in this tribe; the Lema, of which there are no less than sixteen species in North America; only a few occur in Ontario, and I have only found one,—*Lema trilineata,* a beetle which sometimes shares with one of the Blister beetles the title of "the old-fashioned Potato Beetle"; it feeds on various plants of the Potato family and I have found it in some abundance on the Physalus or Ground Cherry, while searching vainly for specimens of *Coptocycla clavata,* the rough Tortoise Beetle. Before we leave the Asparagus and return to our little brook a mile north, I may mention that it was on some garden Asparagus at Lakefield that I found my reward for a day's umpiring at a cricket match, in the shape of a beetle called *Anomoea laticlavia.* This is the only species in the fourth Tribe known to me; for though North America has seven genera in the tribe and over twenty species, there are but four genera represented in Canada, each by a single species. It is for a Chrysomelian a decidedly large insect, stout and of striking appearance, light-brown in colour, with a black sutural stripe, which is slightly thickened from about midway down the elytra to near the apex. I have never since seen it on Asparagus, but more than once I have taken it feeding in large numbers on willow-shrubs about the right of way, a few miles north of our present halting-place on the Peterborough railway. Last year I discovered it very abundant, almost a pest, on wild grape-vines near Sackville's Swamp, on the south shore of Rice Lake, between Bewdley and Gore's Landing.

We now return to the little brook where our first Donacias were captured. Just over the fence, on our right hand, is a small pine wood out of which indeed it is that our little brook emerges. This wood is a great place for early morels; it has also yielded some very interesting species of Longicorn and Clerid on the occasional windfall of white pine. Towards the north-east side of it where our

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way lies, grows a patch of raspberry canes, where I captured once in full flight, with my hand, that most elusive of dodgers, the Oberea. On the leaves of these raspberries one day I saw some tiny dark conical galls, as I supposed, and one of these I tried to tear from the leaf; to my surprise, when I partly wrenched it aside, it distinctly moved and glued itself back on the leaf. This was something new for a gall, and I pulled it away from its fastening to find that it contained a live larva whose legs were kicking frantically to get back to the leaf. You have often seen a refractory man-child plucked suddenly up by the nurse from the place where it was playing? Well, that's how this caterpillar kicked. It was *Chlamys,* one of two genera that represent the fifth tribe. These insects construct a case out of their own excretions and under cover of this tiny, steeple-crowned brownie's cap of a case, they move about and feed securely; when the time comes to pupate, they simply close the door at which they have grazed and behold, a ready-made cocoon. The insect itself is dark brownish black and covered with little warty excrescences; when alarmed it closes its legs and falls to the ground, where it escapes notice entirely or is passed over by warblers and other insectivorous birds as a pebble or a pellet of dirt; one more instance of protective mimicry preserved in this creature through all stages of its existence.

On these same raspberry leaves is often found a small yellow beetle with a black thorax ornamented by two white spots; it frequents many other leaves besides such as basswood and hazel, but it is most abundant on raspberry. It is *Bassareus luteipennis,* the first of seven genera that constitute Tribe VI. These seven genera contain over 100 species, about fifty being found in Ontario. Three of the genera, containing over 35 species are represented right in this wood. Bassareus on the raspberry, *Cryptocephalus quadrimaculatus* (the size of the insect as usual in inverse proportion to its same) on the young shoots of white pine where the needles are soft, and *Pachybrachys* on the willow shrubs at the lower end of the wood. The members of this tribe are small, sometimes minute and stoutly cylindrical in shape, what we would call "chunky"—indeed Pachybrachys (the Greek for "thick-short") is only a grand name for "chunky." Some of the species of Crytocephalus (which means "hidden head") are very pretty, especially *venustus* which I have found on the blossom of the meadow-daisy, and *mutabilis* taken on birch and spiraea.

As we walk back to the road that we left at Mose Robinson's we can collect no less than five genera of the next or seventh Tribe. In the hollow at the north-east of the wood where the clump of willow and dogwood grows, you will find *Xanthonia* on the leaves of the former and *Adoxus* on those of the latter; the first a small and the second a medium-sized beetle, closely resembling each other in shape and general color; about the trunk and limbs of that newly felled pine on the bank, *Glyptoscelis,* a fairly large beetle, metallic brown in color but looking lighter from its pubescence; on the common Dogbane (*Apocynum androsaemifolium*) you will find *Chrysochus aureus,* a large dazzlingly brilliant bluish-green beetle; it is said to feed on Indian hemp (*Apocynum cannabinum*) and on Milkweed (*Asclepias*), but I have never found it on any milkweed or on any other species of Dogbane than the common, sweet-scented species with pinkish blossoms; *Apocynum cannabinum* has greenish-white blossoms and no scent; as the Dogbane is filled with a white milky juice just as abundant as that of the Milkweed, Blatchley's description may be erroneus; on the Dogwood, again, both leaves and blossom, a fifth genus of this tribe (*Colaspis*) is often found.

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Returning to the road just east of Robinson's we face east. South of us lie two upland meadows of rough grass, somewhat rocky and covered with hummocks and watery hollows, a favorite place for the kill-deer plover; here too sometimes in the fall is heard the peculiar cry of the Yellowlegs. As I was walking along here at the end of last April, I heard a strange bird-note; a long, loud whistle, melodious and with something of the plover's plaintiveness about it. After some time I discovered a bird with long narrow wings circling at some height over the meadows, and several times the strange cry was repeated. I brought a friend out with me next week and with the aid of field glasses we watched as many as three pairs of the birds feeding, running and flying about these meadows. On alighting they would raise their wings over their backs till the tips met and then slowly fold them down at the sides, at the same time uttering this long drawn whistle. The bird I had first heard, however, was certainly calling as it hovered and circled high over the field, and as I stood under it I distinctly saw its neck and wings grow rigid for a moment as it forced the cry out on to the air; it was the Bartramian Sand-piper, and this was its mating call. I had the luck to startle a hen bird off her nest of eggs early in May quite near the fence that we are going along. Once the eggs are laid the birds become very shy and can rarely be approached. But in the mating season they seem fairly tame, and we watched one settle twice on the top of a fence post just north of where we are now, within stone's throw of a farm-house. I was standing in the roadway at the time, and my friend was at the snake-fence, his foot on the bottom rail and his field glasses resting on the top, when I noticed a weasel running along the bottom rail in our direction; it showed not the slightest fear and never hesitated, but advancing steadily, stepped right over my friend's foot; in its teeth it held by the nape of the neck, limp and lifeless, a large field-mouse, doubtless the family dinner. These creatures are very bold and show the utmost unconcern of human beings. I remember being stopped some years ago by a section boss on the railway who asked to show me a nest under a culvert that his gang had been cleaning out; "There," he said, disclosing four little blind nestlings, "What's them"? "Why," I said. "they look like weasels." "That's what they are, I reckon," came the answer, "and the mother fought like a good one for nearly an hour to get back to them; we had to drive her off with stones before we could get at work on the culvert."

Along this stretch of road, within the space of a few rods, we shall find no less than five genera belonging to the eighth Tribe on our list. Under chips of wood by the roadside in the early spring, I have frequently found a small beetle, variegated black with yellow-brown stripes, called *Prasocuris;* on the common milkweed the large handsomely marked orange and black *Doryphora clivicollis* and on the bittersweet growing over that stone-pile, its cousin *Doryphora decemlineata,* that ubiquitous pest, the Colorado potato-beetle; in the blossom of the dogwood, a small metallic dark-green beetle that feeds also on elm leaves, *Plagiodera viridis;* about the knotweed at the wood's margin, the pretty little *Gastroidea polygoni* with yellow-brown thorax and peacock-green elytra; while in the grass a little further on I took two specimens of *Lina scripta* as early as the end of April; no doubt hibernated specimens, probably from the willow clump nearby, for that is a favorite food plant of the *Lina scripta;* it is a somewhat variable species, of which I have found two quite distinct forms on the willow, one the normal form at Guelph and the other near Lindsay. There still remains in this tribe a genus that I have so far left unmentioned, the most beautiful of all the family and well worthy of the high compliment (*pace* the economic entomologist) paid it by

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naturalists,—*Chrysomela* (Golden Apple—or is it an Homeric word meaning "golden sheep"?) from which the tribe gets its name of Chrysomelini or Chrysomela-like beetles, and the whole family its name of Chrysomelidae, the scions or clan of Chrysomela. This is a most beautiful beetle; the characteristic appearance being roundish-oval in shape and decidedly convex above; head and thorax mostly dark metallic and wing-covers a creamy white, daintily sculptured with metallic greenish or bluish black. It suggests old ivory inlaid with ebony or jet. In the early days of collecting, this was a beetle I coveted more than any other; the species that above all took my fancy being *Chrysomela scalaris*. There was a brother-collector in town whose cases I was continually poring over. But it was in my second season as a collector that I first had the luck to "strike ile," and it was right on that dogwood bush behind the north fence of our road. I found here several specimens of a Chrysomela rather smaller than *scalaris* with greenish-black head and thorax, elytra cream-coloured and finely sculptured and dotted with metallic greenish black; it proved to be *Chrysomela philadelphica*, and a short search among dogwood shrubs yielded me some 50 specimens of the beetle. This was at the end of June and in July I migrated with all my bug-and-weed paraphernalia to the Rideau Lakes. It wasn't long before I found grazing on basswood leaves along with walking-stick insects, whole flocks of a small whitish larva, marked with black, somewhat louse-shaped, and so strongly resembling the larva of the Potato-beetle that visions of *Chrysomela scalaris* began again to float before my excited imagination and to haunt my dreams. I separated about fifteen of the best grown lambs of the flock and shepherded them home to a domestic fold. But they seemed to scorn captivity and quite obviously pined in their cardboard box. Twice a day I brought them fresh fodder from their native pasture, but they wouldn't browse worth a cent; and I lost one or two with every moult; less than half a dozen reached maturity and of these two died in pupating. However, three emerged safely and proved the realization of my dream, *Chrysomela scalaris*, all the more lovely in being home-grown.

The knowledge that hundreds of these creatures must have matured about the basswood trees where I had made my captures drew me out to their feeding-grounds again. This time I searched in vain, not a larva could I see on any of the leaves, still less a mature insect; for the full-fed larva in this genus drops to the ground in order to pupate, and though it was the beetle itself that I had found gregarious on the dogwood, there seemed to be no such luck in the case of this species; at the end of two hours I was still empty-handed. It was when I was passing across a stubble-field in the open from one part of the edge of the wood to another that I felt something crawling on the back of my neck. Of course, gentlemen, you all know the extraordinary phenomenon of an insect crawling on the back of the neck. No matter how rare it may have been when it first settled, if once you reach with your hand to make a capture it nearly always—well if you wish for an exact figure, in ninety-nine cases out of a hundred it turns into an aculeate hymenopteron and poniards the cord of your neck with that most venomous of stilettos, the wasp-sting; in the hundredth case of course, it simply flies away. I was on the horns of a dilemma: if that creature was *Chrysomela scalaris* I wanted it badly; on the other hand I stood good chances of being stung, literally or figuratively, by its proving a wasp or something worthless or making its escape. My embarrassment was worse than that of the cockney sportsman (as pictured by *Punch*) when the bird he was aiming at suddenly settled on the middle of his gun-barrel; because, though I am told this would make a very difficult shot,

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at least the man knew what he was trying to bag. There were big risks, it was a daring shot, but I took it and grabbed the insect as it was pushing down behind the collar of my negligé. An awful moment, while I waited for telegraphic communication from my neck to my inner consciousness of the sensation of five inches of hatpin jabbed viciously in to the quick and centre of one's being, that matter-of-fact people call a wasp-sting; but there was no telegram, this was the hundredth chance, and sure enough, when I came to look at my capture, it was what I had been looking for—*Chrysomela scalaris*. Where had it come from? I am certain there was none on the basswood; it had simply dropped out of pure cussedness on to my head, I presume from the sky. Next season I found three more species, one on willows very like *Chr. philadelphica* of the dogwood, but with the front and sides of the thorax margined with cream; I have taken a great many specimens of this beetle in various places, always on the willow; it is *Chr. bigsbyana*. The second new species was a smaller member of the genus called *Chr. elegans*, first found early in the season crawling on railway ties, which are not its food-plant, but afterwards found feeding in abundance on water smart-weed about the surface of a stream a couple of miles south-east of here.

There is another species of small size closely resembling this, called *Chr. suturalis*. I have never discovered the food plant to which this beetle resorts about Port Hope, but I have twice found a stray specimen on grass-blades. One year in August when I returned from my holidays, I was looking over my friend's collection of Chrysomelas, mentally checking off their food-plants as my eye roved from species to species; basswood, dogwood, willow, water smartweed and so on, when suddenly, my attention was arrested by a whole row of fine specimens of this beetle. "Hullo," I exclaimed, "where did you get these?" "Oh, on the beach, just a few days ago." In an instant I had registered a silent vow, and next morning hastened off to fulfil it in our old stand-by, the North Wood, equipped for the sacrifice with some sandwiches and a cyanide bottle. All the morning I searched beech trees diligently, without success, and all the afternoon the same, and at last went home, weary and footsore, having got nothing but aching eyes and a stiff neck. In the evening I was around again at my friend's collection. "Are you sure that you got those beetles on the beech?" I asked. "Oh, yes, and they were in fine condition; in fact one of them was still alive. I guess a thunder-storm the day before had blown them out over the lake; when I went down the south-east wind was washing them up on the beach." My beech with an "e," was his beach with an "a"; he had taken his specimens on the lake shore. Disappointments like these are bound to occur; I have spent days in search among spiraea and hazels which the collectors say are the invariable food of certain species and so far the result has been an absolute blank.

We will move east about a mile, past Davison's old chair-factory on the Rice Lake Road, up hill, down dale, and up hill again as far as Bethel. Here we turn south down a grass lane to a wood of pine, oak and maple, and skirt along the edge of this wood, keeping close to the fence. Notice that sandy knoll in the wood, just west of us, with a large burrow at the top; I was approaching this one day from the south, gathering morsels as I went, when I felt that curious sense of being watched that we sometimes have. Looking up I saw what I took to be a young collie dog, reddish-brown, sharp-faced, staring straight at me; as soon as it saw me look at it, it made a movement that is very characteristic of the collie, dropped flat on the ground, its head couched between the outstretched fore-paws and so lay,

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alert and watchful; I took a pace or two forward, when suddenly it did what no collie ever did, dived headlong into a sand-burrow and disappeared; it was a puppy to be sure, about half-grown—a young red fox.

A quarter of an hour's walk south-east brings us to our favorite lunching-ground, a huge pine tree surrounded by glacial boulders right at the top of a steep slope facing south; for we are on a table-land here, some 300 feet above Lake Ontario, with a magnificent view, east, west and south. This is probably the old shore line of Lake Ontario. Indeed a few miles west there are clear traces of an old beach five or six miles north of the Lake's present boundary. The top of this hypothetical cliff overlooking an ancient Lake Ontario is clearly marked east and west by its fringe of white pine. East of us there must have been a magnificent bay, for the edge of the table-land recedes in a sharp curve for nearly a mile north, and then comes forward again with a sinuous sweep to the east. Out of the two corners of this bay now proceed south-west and south-east two little trout streams whose union half-way down the sloping valley results in Gage's Creek, a stream that meanders along through five or six miles of level farm land and at last reaches the lake just east of Trinity College School.

After lunch we descend the slope to a rough meadow at the foot, on the edge of a tamarack swamp. Here we can examine some genera of the ninth Tribe of Chrysomelians; on the golden-rod which earlier in the year was badly eaten by the larvæ of *Trirhabda canadensis*, we see the mature insect; a large soft-winged beetle of a yellowish colour with a black or dark grey line on the outside of its wing-covers and a sutural stripe of the same down the centre of the back. Later in the year you will find two species of *Diabrotica*, commonly known as the spotted and the striped kind respectively of Squash beetle, their favorite food (especially in the larval state) being cucumber and melon vines. A third genus of this tribe I got two specimens of, on the edge of the swamp south of this meadow, but I only once have found it abundant and that was in the Algonquin Park, in a marshy bay at the shore of Cache Lake; it is said to be rare and Blatchley states its food-plant to be Arrow Arum (*Peltandra*); I found hundreds of it, feeding on a small species of the Skull Cap or *Scutellaria*; it is oblong, soft-winged, light yellow-brown in colour, with two black patches on each wing-cover,—a small one at the base and a large one near the apex; its name is *Phyllobrotica discoidea*. One more genus is represented here,—*Galerucella decora*, on the willow, and *luteola* on elm shoots at the west end of the meadow; a third species, *nymphaea*, is found on lily-pads; some species are quite a pest, appearing in immense numbers and destroying a great deal of foliage.

We will now walk west along the north end of Holdsworth's farm to the road that runs south between Holdsworth's and a farm of John Hume, the Port Hope seedsman. After crossing the road we come to a little brook. On the water smartweed that grows in this stream I found, three or four years ago, quite a number of medium sized black and light-brown striped beetles that worked a new trick on me in methods of escape and with considerable success. I was used to beetles that took to flight suddenly and also to beetles that dropped from their perch on leaf or plant into the tangle of vegetation below, but except for the small flea-beetles of grapevine, alder, turnip, horseradish and so on I was not prepared for jumpers. But this whole tenth Tribe consists of jumping-beetles and their hind-thighs are greatly thickened in consequence. Their name Halticini is taken from the genus *Haltica* or Flea-beetle; the name simply means "the jumper." This beetle of the water smartweed, is *Disonycha pennsylvanica*; a much larger beetle of the same

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genus I have often found on willow bushes by the railway near Carmel, twelve miles north of Port Hope, and also at several points in the Algonquin Park. It is light yellow-brown with a black margin round each wing-cover and a black stripe down the middle of the same; thighs and abdomen orange-coloured; it is *Disonycha caroliniana* and a most active leaper. There is one more genus of these leapers that I have found, said to be uncommon in Ontario; it is a very pretty beetle of fair size, with a close superficial resemblance (in size, shape and colour) to *Chrysomela lunata;* reddish brown all over, this color, on the elytra, being broken into irregular stripes by narrow wavy lines of yellow. I have found it abundant on the north shore of the Upper Rideau, feeding always on the Fragrant or Canada Sumach. Blatchley describes it as "common on the sumach," but I have never found it on the poison-ivy or the stag-horn, only on the Canada sumach, which is a small shrub about the size of a gooseberry bush, having leaves almost identical with those of the poison-ivy, i.e., divided into three leaflets and slightly toothed on one or both margins; the bark and wood are fragrant, but with a certain pungency, not altogether pleasant. I shall never forget the time and the place that I first found this beetle, *Blepharida rhois;* for I got that day several treasures—this new beetle, a new fern (the ebony spleenwort) the rock selaginella, a new tree (the red cedar) and a new shrub (the Canada Sumach).

We are now on our way home. First we strike south-west for a couple of miles, through fields and woods: just before we reach the Sowden farm, we pass through some stumps of basswood, round whose base a sheaf of leafy twigs has sprouted. On these leaves I have found a smallish wedge-shaped beetle, reddish-brown in color, with some small, darker marks on it; its surface is peculiarly striated lengthwise by alternate furrows and ridges. It is called *Odontota rubra,* a leaf miner, feeding between the upper and the under surfaces of leaves and often in the larval stage very abundant on bass wood; it is the only representative of the eleventh tribe known to me.

At the Sowden farm we turn west on the old York coach road from Toronto to Kingston and pass presently through Dale or Bletcher's Corners. Arrived at the railway track we go south along it to the iron bridge over the Ganaraska at the head of Corbett's pond. Just before we cross you will notice on the steep embankment to our right hand a great growth of wild convolvulus or Morning Glory. It was here that I first found the *Coptocycla aurichalcea,* a little tortoise beetle of most marvellous brilliance; it looks, when seen alive on its food-plant, like a dew-drop sparkling in the sunshine and equally iridescent, but this dazzling lustre fades after death to a red gold. It was on the south shore of the lower Rideau that I first met this last tribe of the Chrysomelidae, the Tortoise-beetles. Feeding together on wild convolvulus, meadow-rue and one or two other plants by the margin of the lake, I found two sorts of beetle, one large and the other small. There were larvæ as well as beetles of both kinds on the same plant and often on the same leaf. They proved to be *Coptocycla guttata,* a less brilliant beetle than *aurichalcea,* and *Chelymorpha argus.* I took some larvæ and pupæ as well as imagoes home with me and watched them mature. These insects have devised a most extraordinary means of protecting themselves. From the end of the larva's abdomen protrudes what naturalists are pleased to call a forked process; on this miniature rack the creature's moults are spread and converted into a sort of tarpaulin by liquid excretions; this is then retroverted and dangles over the creature's back like an umbrella. I wonder if any of you ever came across an old book called the "Voyage and Travels of Sir John Mandeville"; this mediaeval

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De Rougemont, borrowing some of his choicest traveller's tales from Herodotus, Pliny and others, describes a one-legged race of men in Africa who go so fast that (as the author justly observes) it is marvellous. As disuse leads to atrophy, much use produces hypertrophy, and Mandeville declares these one-legged men have developed such enormous feet that in the heat of the day they sit on the sand and hold their foot as a parasol over the head. In my edition of the work there is a woodcut illustrating this description, in which a native is seated on his one haunch (how to balance oneself must be as great a problem with that race as Columbus tackled in the hen's egg), shading himself from the sun with his foot over his head.

Some naturalists think that these larvæ are seeking protection from the sun in spreading this forked process over their back. But it seems more likely that they do it to escape detection by some bird-foe for whom they would be a dainty morsel. What makes me think so is that the pupa, too, is protected in a curious way. The full-grown larva pupates attached by some silk thread to the leaf, more or less exposed and helpless, but as soon as the pupa forms almost its entire surface turns greyish or bluish white; it looks like a creature that has died and been attacked by a fungus growth of mildew. It so deceived me that I was on the point of throwing specimens away. It was only when I took one between finger and thumb and felt it writhe firmly under my touch that I realized the deception. Doubtless one more case of protective mimicry.

Now, gentlemen, we are nearly home. We skirt the side of Corbett's Pond, where in May you will sometimes find on the mud flats seven or eight species of plover and sandpiper at a time, and passing along Hope Street turn up a lane near the C. N. R. bridge at Ontario Street. This takes us to De Blaquière Street, and one block brings us to the plantation of young trees sent from Guelph to Trinity College School a few years ago. Here we cross the cricket ground and gain the school, my home for more than twelve years. We have been out all day, and walked some fifteen miles, and I seem to have done a great deal of talking. I only hope I have not wearied you.

APPLIED ENTOMOLOGY FOR THE FARMER.

F. M. Webster, Washington, D.C.

Of all husbandmen, the true farmer, the grower of grains and forage crops for sale or consumption on his premises, has been the last to profit by the applied science of entomology. He in the past has indeed supposed himself as helpless against the inroads of insects upon his crops as the Indian squaw whose only hope of saving her patch of Indian corn was in the effect of charms and incantations in warding off attacks of wireworms, cutworms, and perhaps other similar pests.

The beginnings in applied entomology consisted in dusting garden vegetables with soot, lime, ashes, and, somewhat later, with powdered hellebore. But to the farmer these precautions meant practically nothing. Though his farm might not be a large one, the area was usually too wide to render these measures practicable even if they proved effective in a small way. It is true that the trapping of cutworms under compact bunches of elder sprouts, milkweed, clover and mullen, "placed in every fifth row between every sixth hill," was known as early as 1838, but

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these constituted only a trap or baits, the worms found under the traps being killed by some sharp instrument. This measure, however, seems never to have become popular.

The spread of the so-called Colorado potato beetle over the country from the west eastward brought the use of Paris green and London purple as insecticides to the front, but, again, this did not help in the least the troubles of the ordinary farmer.

The work of Riley, Packard and Thomas, on the western migratory locust was the first important effort made to aid the farmer in devising practical measures of fighting destructive insects over large areas.

The spread of the cabbage butterfly from the east to the westward brought into use as an insecticide the powdered blossoms of Pyrethrum, but the farmer does not raise cabbage as either a grain or a forage crop.

Studies of the cotton worm, by Riley and others, brought Paris green again into use and developed that useful insecticide, kerosene emulsion, but the farmer cannot make use of these in his cultivation of wheat, oats, corn, rye or barley; neither can he apply them to insect pests on his broad acres of forage crops.

In the same way, fighting the codling moth and San José scale have developed the use of arsenical sprays, as well as those of lime and sulphur, crude petroleum and other sprays and washes. But none of these are of the slightest use to the farmer in his fields, no matter how valuable they may have been to the fruit grower.

The farmer has therefore largely occupied the position of a skeptical spectator, who, while seeing clearly the benefits derived from applied entomology by his brother husbandmen, the fruit grower, the gardener, and even the cotton planter, was seemingly himself debarred from sharing in these benefits, because of the measures being inapplicable to his crops, and, even if this were not the case, his wide areas would render their use impracticable.

Besides all of this the farmer has, himself, held somewhat the position of a critical onlooker as the result of other causes.

Before the advent of experiment stations, and even for some time afterwards, letters addressed to the members of university faculties, complaining of the ravages of insects and asking relief, brought the actual farmer little consolation. The replies he received to his appeals for relief were usually couched in terms to which he was unused, and much of the text of these replies in a language that he did not understand. Moreover, the replies were usually penned by men who had little or no practical knowledge of agriculture, and thus there grew up between the two not only a continually widening breach, but in many cases an absolutely intolerant feeling on the part of each for the other.

This was approximately the relative position of the man from the campus and the man from the farm, at the time of the establishing of the Experiment Stations, though there were, of course, some brilliant exceptions. Besides this, many, probably the majority, of those who were afterwards to make the Experiment Stations a success, were yet to be trained and given their practical experience in combining the science and practice of agriculture; and it may be stated that the science of entomology, for reasons previously given, has impressed the farmer the least favourably. Farmers had always looked upon insect depredations precisely as they did other natural phenomena like drouth, storms and floods, fully convinced by ages of experience that nothing could be done to prevent them, and, therefore they must be endured to the end. Entomological literature, however elementary and

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popular, they simply would not read. This was, generally speaking, the situation, at the time when I was just beginning my entomological work among the farmers of Illinois.

We will now step over the intervening twenty-five years and look at the situation as it is to-day. It will be an obscure section of the country indeed, if, where there are serious insect depredations going on, we at the Department of Agriculture do not promptly receive a report of it through one or the other of several sources. These reports are received through letters addressed direct to either the Department or Bureau, and are coming each year with increasing frequency, through experiment stations, the press, and, last though not least, through members of Congress.

Perhaps nothing better illustrates the changed condition and rapid growth of agriculture as a science than the immense strides made by economic entomology as applied over and throughout the broad acres of the ordinary farmer. At the present time, instead of receiving a stereotyped reply to his applications for relief, when he applies as an individual, or for his neighbourhood, to the Department of Agriculture, either directly, or, as is becoming every day more and more frequent, through his representative in Congress, he is very often surprised when, within two or three days after the receipt of his complaint, there appears in his neighbourhood a young man who, in most cases, has grown up a farmer's son on the farm, and, besides this, has had a thorough university training, and, perhaps, is further equipped by having been engaged in the investigation of insects over a wide range of country, including perhaps no small number of the United States. Instead of receiving a letter which to him might, perhaps, so far as practical aid is concerned, have been written in a foreign language, he finds that his visitor can go about over his and his neighbours' farms with him, and with a clear understanding of the crops cultivated can point out the work of insects and tell them in what manner they might have avoided these injuries and saved their money. He will tell him of things that, though he may have spent a lifetime in farming, neither the farmer nor his neighbours have ever yet been able to observe. His caller not only fits into their farm life and speaks to him in the language of the farmer, but is able to explain, in a perfectly natural and intelligible way, much of what to him has heretofore been a mystery. The young man points out to him wherein their farm methods have, in many cases, been primarily responsible for their previously sustained losses by insect attack. The farmer is now in a position to read entomological literature intelligently and with pleasure to himself. It does not greatly matter of what State he may be a resident, if his locality is not too inaccessible, and the matter is of more than local importance, any of the men located at the fifteen different field stations can be wired instructions that will send them to his relief. In this way entomology as applied to the broad acres of the farm has within the last twenty-five years become completely revolutionized. This means much to the growers of grains and forage crops and to the stock breeder. Moreover, it means almost equally as much to the banker, the manufacturer and the merchant, all of whom are coming to recognize the fact. It has been my own practice to take up only such investigations as involve several States, leaving local matters to State institutions, where such are equipped for the work, and, when called upon to deal with such, I have urged that the State be at least given an opportunity to help itself, while we stood ready to reinforce their efforts if need be. This course has been followed especially with reference to local outbreaks of grasshoppers. Where investigations can be carried

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out in any State, as a part of an extended plan of work, notably that of wheat sowing in fall to evade the fall attack of Hessian fly, we have carried out such experiments with the co-operation of farmers at whatever points seemed most desirable for obtaining results which would benefit the greatest number of farmers. In many cases these sowings have been also made in co-operation with State institutions. The alfalfa weevil investigation have been carried on in co-operation with the State agricultural college and station at their request.

Besides the field laboratories there are being carried on field experiments, out on the farms, under precisely the same conditions as those which the farmer has himself to meet. These experiments are conducted in such a way that farmers can see just what is done, how it is done, as well as the object of the experiment itself. They can also see what results are obtained, and what we have done, under their conditions, they, under like conditions, can do for themselves; and the proof thereof is right before their eyes in their own fields. We find that these object-lessons and personal contact are primarily worth vastly more than whole volumes of literature, and gradually the farmer is coming to learn that there is help for him as well as for the horticulturist, in combating insect pests, even though his acreage may be many times theirs and his crops radically different in nature.

INSECT GALLS.

By A. Cosens, Ph.D., Toronto.

(Abstract of Lecture, illustrated by lantern slides.)

In the evolution of the study of galls there are different epochs, each merging gradually into the following. From early historical times these abnormal structures have excited attention. In the first instance, this was in all probability due to the fact that they presented phenomena unusual and out of the ordinary. At this earliest epoch witchcraft and like fanciful explanations were proposed to account for their origin. Gradually, as they were better understood and seen to involve a stimulus by a parasite and a response by a host, the examination of them became more scientific, and the hypotheses concerning their causes, as a consequence, more valuable. The problem presented was recognized as one of great scientific interest, since it presented the unique feature of a foreign organism stimulating and controlling for its own benefit the growth of a host. Within the last few years it has been shown that a close relation exists between the structure of the bacterial crown gall and certain malignant animal tumors. Thus the second epoch with the subjects of theoretical interest seems gradually to be passing into a third in which it will rank as one of the greatest practical importance.

The term "gall" is applied to any enlargement of plant cells, tissues, or organs induced by the stimulus of a parasitic organism as a regular incident in the life history of the parasite.

Galls are divided into two classes, according to the agent that produces the stimulus—namely, *Phytocecidia*, those owing their origin to parasitic plants, and *Zoocecidia*, those produced by animal parasites. The former are caused by many different classes of plants, myxomycetes, bacteria, algæ and fungi. Even the flowering plants are represented among the gall producers, since the witches'

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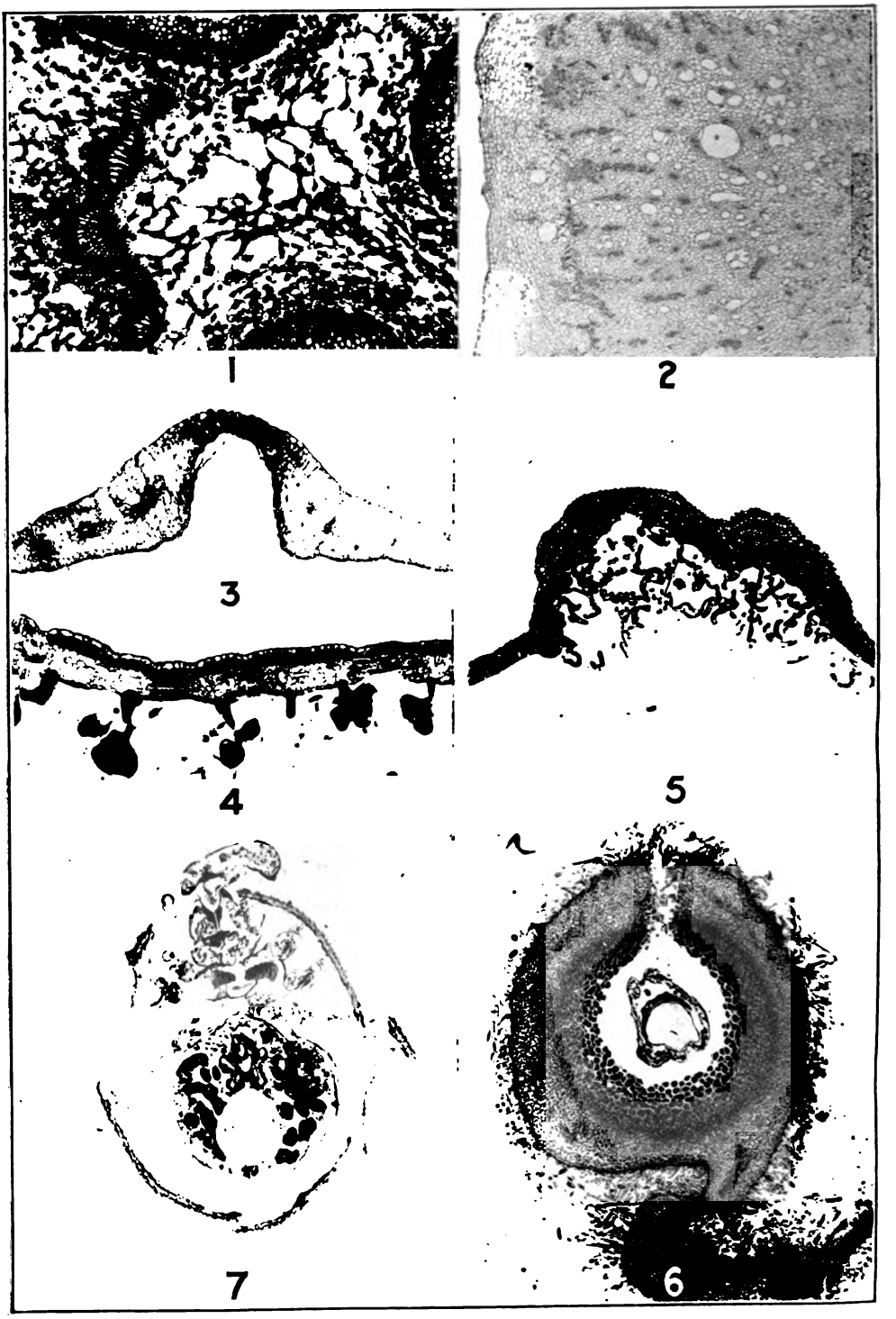

PLATE 2.—Structures of Insect Galls and their Producers.

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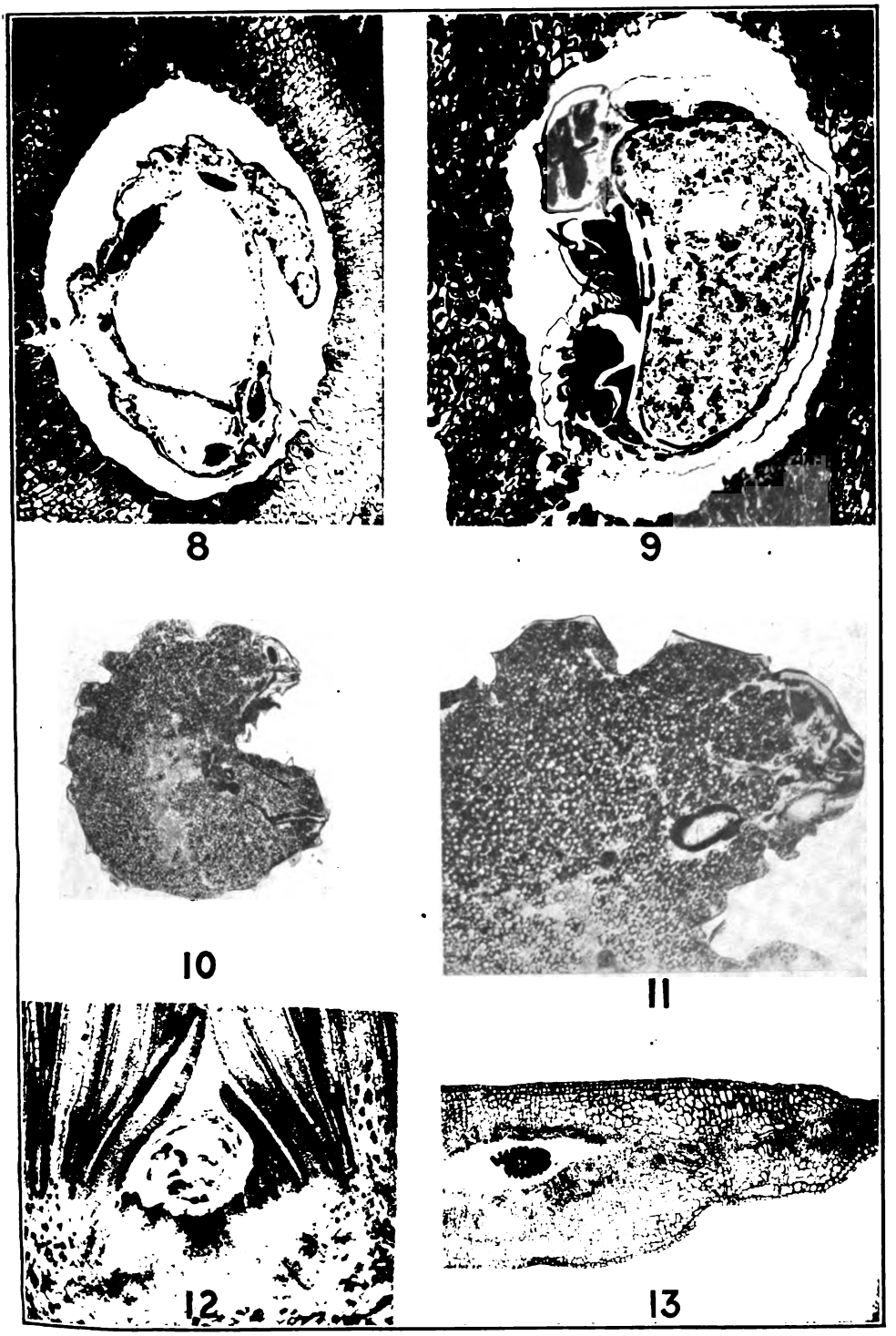

PLATE 3.—Structures of Insect Galls and their Producers.

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The trichomes exemplify the principle in a very similar manner to the glands. When the gall produces types different from the normal, these are almost invariably found on the reproductive axes of the host. The unicellular acicular hairs of *Eriophyes querci* Garman, are totally unlike the stellate hairs of the leaf, but their exact counterparts are found on the reproductive axes of the host *Quercus macrocarpa* Michx. The much convoluted type of hair present in the Acarina dimple gall on the leaves of *Acer negundo* L. (Fig. 5), are found plentifully distributed over the reproductive axes, although the normal leaf hairs are straight. The trichome-producing activity of the protoplasm has thus been stimulated by the foreign organism to a degree reached in the normal only at the time of reproduction.

The production of aeriferous tissue in certain Salicaceous galls also substantiates the principle in a very striking manner. These galls contain examples of a typical aeriferous tissue, comparable indeed, to that found in such aquatics as Nymphæa, Potamogeton or Saururus; while in the corresponding part of the host it does not occur. Indeed, this statement may be extended to include all the species of the host genus. A cross section of the gall originated on *Salix cordata* Muhl. by *Rhabdophaga triticoides* Walsh, shows this tissue surrounding each larval cell. It is present in the abnormal stem and extends entirely across the pith, as can be seen in Fig. 1. While this tissue is present in the primary cortex of the normal stem of both Salix and Populus, and indicated in the pith of the latter, it is entirely absent from the pith in the corresponding part of the stem of Salix. It is abundant in such primitive regions of Salix as the reproductive axes, nodes and leaf traces. Thus the unexpected appearance of this tissue in the gall cited is readily explainable on the same grounds as in the case of the glands and trichomes —namely, the power to produce this tissue is latent in the protoplasm of the host, and it becomes sufficiently active to reinstate the tissue only when the gall-producing stimulus gives rise to unusual conditions.

A further illustration of this principle is shown in the production of cork in an aphid gall on the leaf of *Passiflora suberosa*. While this tissue is entirely absent from the unstimulated leaf, the stem produces it normally. Also, *Rhodites multispinosus* Gillette stimulates the usually unarmed stem of *Rosa blanda* Ait. to the production of an exceedingly spiny gall. The production of spines, however, is a marked characteristic of the genus and a dormant activity has again been aroused.

Concerning the mode of application of the stimulus by the parasite, it may be stated that in none of the families of insects except the Tenthredinidæ is there any evidence that indicates the beginning of gall formation before the hatching of the larva. In this family the source of the stimulus is in all probability the ovipositor of the insect, since it has been conclusively shown that the gall structure is well advanced while the larva is still within the egg membranes. This fact is exemplified in Fig. 13.

From observations on the galls of *Neuroterus læviusculus* and *Biorhiza aptera*, Adler concluded that cell division commenced only after the larva emerged from the egg. Weidel lately has shown that such is the case in the gall produced by *Neuroterus vesicator* Schlecht. It may, as a consequence, be accepted as proven that the source of the stimulus in the galls produced by the Cynipidæ is the larva of the producer.

As already published*, the writer has proven by a series of experiments, that the larva of *Amphibolips confluens* Harris, secretes an enzyme capable of changing

*Transactions of the Canadian Institute, Vol. IX, 1912.

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starch to sugar, and has also demonstrated the presence of salivary glands opening externally in *Philonix nigra* Gillette (Fig. 11), and *Amphibolips confluens* Harris. We may conclude, then, that at least one enzyme is present in the salivary secretion of the larvæ of the Cynipidæ and that this acts as a pre-digestive ferment on the contents of the nutritive zone. By its action, starch is changed into a readily soluble substance, and is consequently readily absorbed by the digestive tract of the larva.

The fact that excrement is not found in Cynipid galls has formerly been explained by the assumption that the alimentary canal of the larva ends blindly. As the writer has demonstrated its completeness in *Philonix nigra* Gillettee (Fig. 10), and *Amphibolips confluens* Harris, this is probably the case in all of the species. The correct explanation for the absence of frass is that the larva uses as food only the cell contents of the nutritive zone, and these have been rendered capable of complete absorption by the amylalytic ferment in the larval secretion. A very marked feature of the nutritive zone of the galls is the gradual collapsing of the cells as their contents are removed. Compare Figs. 6 and 7. Since the cell walls lining the Cynipid larval chamber are not broken by the larva in feeding, the interior of the cavity remains smooth, a marked contrast to the ragged, broken edge of tissue left where an inquiline larva has been feeding. A comparison of Figs. 8 and 9 will demonstrate this. The difference in the nature of the food is shown in the stomach contents of the Cynipid and the inquiline larva. The former consists of a mass of extremely fine particles, among which can be detected nothing that is recognizable as having formed a part of a cell (Fig. 8), but the latter is composed of much coarser material in which crystals and parts of cell walls can be easily detected (Fig. 9).

As well as thus acting as a pre-digestive factor the ferment in the larval salivary secretion has an indirect action on the production of the gall. Owing to its influence the nutritive zone will become stored with an unusually large amount of available nourishment which can diffuse to all parts of the gall. The protoplasm of the latter is thus rendered unusually active, since it receives an abnormal quantity of available food material in a limited area. The hypertrophy and cell proliferation and probably also the appearance of vestigial tissue, or other primary characters are explainable as the response of the protoplasm of the host to the additional food supply.

Description of Plates 2 and 3.

Fig. 1. ***Rhabdophaga triticoides*** **Walsh on the stem of** ***Salix cordata*** **Muhl. Transverse section of a young gall, in which is shown the general arrangement of the larval chambers and the distribution of aeriferous tissue throughout the cortex and pith of the gall. The edges of three larval chambers are bounding the pith of the gall. ×50.**

Fig. 2. ***Eurosta solidaginis*** **Fitch on the stem of** ***Solidago canadensis*** **L. Transverse section showing the proliferation of glandular tissue. ×25.**

Fig. 3. ***Cecidomyia ocellaris*** **O.S. on the leaf of** ***Acer rubrum*** **L., showing the almost unchanged character of the leaf immediately below the larva, and the great amount of proliferation in the region surrounding it. ×30.**

Fig. 4. ***Eriophyes*** **sp. (*Fagus grandifolia* Ehrh.) Section through a number of capitate trichomes. The almost normal character of the leaf is shown. ×50.**

Fig. 5. ***Eriophyes*** **sp. (*Acer negundo* L.) Section through the gall, showing a large number of convoluted trichomes. ×35.**

Fig. 6. ***Dryophanta palustris*** **O.S. on the leaf of** ***Quercus velutina*** **Lam. Section of a very early stage in which the inner and outer galls are still in contact. ×30.**

Fig. 7. ***Dryophanta palustris*** **O.S. on the leaf of** ***Quercus velutina*** **Lam. Section of the larval chamber of a mature specimen, showing the insect breaking out of the inner gall. At this stage the nutritive layer has entirely collapsed. ×15.**

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FIG. 8. *Holcaspis bassetti* Gillette on the stem of *Quercus macrocarpa* Michx. Section through the gall cavity with enclosed larva. The character of the cells of the nutritive zone is shown and the unbroken edge of the inside boundary. ×60.

FIG. 9. Section of a larval inquiline from the gall *Holcaspis bassetti* Gillette. The broken edge of the tissue on which the larva has been feeding is shown, also the comparatively coarse material of the stomach contents. ×60.

FIG. 10. *Philonix nigra* Gillette. Longitudinal section of the larva, showing the external opening of the alimentary canal. ×15.

FIG. 11. *Philonix nigra* Gillette. Longitudinal section of the head of the larva passing through a salivary gland and its associated duct. The opening is just below the mouth. ×40.

FIG. 12. *Rhabdophaga strobiloides* Walsh on the stem of *Salix cordata* Muhl. Longitudinal section, showing the larva in contact with the small-celled tissue at the apex of the stem. ×25.

FIG. 13. *Pontania hyalina* Norton on *Salix alba* L. Section of gall with larva still within the egg membrane. Proliferation is shown well advanced in all the tissues of the leaf. ×35.

ANTS.

(Abstract of Illustrated Lecture on "Ants," by Prof. W. M. Wheeler.)

By way of preface the lecturer made some general statements in regard to the 5,000 known species and sub-species of ants, and described the development and metamorphosis of the individual ant, the various castes, or polymorphic phases represented by each species and the function of each of these castes in the life of the colony. Then the general behaviour of ants was treated from the standpoint of the three basic biological activities, namely reproduction, nutrition and protection.

Special emphasis was placed on the behaviour of the female, or queen ant and her methods of establishing the colony in contrast with the behaviour of the queen honey-bee and with the male ant, which takes no part in the activities of the colony as such, but functions only as a fecundating agency during the nuptial flight. The queen ant was shown to possess all the instincts of the worker forms in addition to some of her own and thus to represent the most complete embodiment or epitome of the species. This statement requires qualification only in the case of certain parasitic and slave making species, in which the queen is degenerate like the queen honey bee and no longer able to establish a colony and bring up the first brood of her offspring without the aid of workers either of her own or of an alien species.

The peculiar structure of the ant's alimentary tract was described in some detail, with its "social" and "individual" stomachs, which enable the insects not only to store their liquid food in the most economical manner but also to distribute it equally among the various members of the colony both larval and adult. For the purpose of illustrating this portion of the lecture more fully the various adaptations of ants to living in very dry regions, such as deserts, were examined, and it was shown that these insects have evolved four very different methods of circumventing the difficulties inseparable from life under conditions that imply a great scarcity of their natural insect food. A certain number of species have exaggerated their primitive predatory instincts and have become rapacious hunters (e.g. the species of *Cataglyphis* in the North African deserts). Others have taken to storing quantities of liquid food in the crops, or social stomachs of certain

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workers of the colony for the purpose of tiding over the long droughts (e.g. the honey ants of the South-western States and Australia belonging to the genera *Myrmecocystus, Melophorus, Camponotus, Leptomyrmex,* etc.) Other species have become agricultural or havesting ants (the species of *Messor, Pogonomyrmex,* many species of *Meranoplus, Pheidole, Solenopsis,* etc.) and have therefore become addicted to a vegetable diet. These forms store the seeds of various desert plants in their nests. Lastly, a group of American ants, comprising the species of *Atta* and allied genera, has learned to grow fungi for food on pieces of leaves, caterpillar excrement or other vegetable detritus. Although this habit seems to have originated in the moist woods of South and Central America, several of the species which acquired it were able by its means to invade the deserts of the Mexican plateau and of the South-western States and thus to remain independent of the precarious supply of insect food peculiar to those regions. This represents the most specialized stage of ant dietetics.

The protective instincts of ants, apart from their stinging and biting proclivities, attain their most striking expression in the construction of the nests. The various types of these structures were briefly considered: the small crater nests in the soil, the nests under stones and in wood, the larger mound nests, which are characterized by a superstructure of accumulated vegetable detritus which is used as an incubator for the larvæ and pupæ, the carton nests constructed in trees by various tropical ants of the genera *Cremastogaster, Azteca, Dolichoderus* and *Polyrhachis,* and the extraordinary silken nests of *Oecophylla smaragdina* and some species of *Polyrhachis* and *Camponotus,* which are woven by the ants using their spinning larvæ as shuttles.

THE EXCURSION TO GRIMSBY.

In accordance with the pre-arranged programme the visiting entomologists were all invited to participate in an excursion to the town of Grimsby, which is situated near the centre of the chief peach district of the Province. About thirty-five availed themselves of the opportunity. It had been expected that the party would arrive at Windsor soon after noon, but owing to a very severe thunderstorm the previous evening the electric cars were running very irregularly and it was not until about 2 p.m. that the party arrived there. Lunch was at once served. After lunch there were two or three very interesting short addresses of appreciation of the pleasant trip and of the entertainment. Immediately afterwards those who were enthusiastic collectors set out in a body to search the flower-clad side of the so-called mountain for their favorite kinds of insects. The remainder, under the guidance of Mr. Cæsar, visited the neighboring orchards, especially the peach orchards. Fortunately the peaches were just ready to pick and the healthy trees with their luxuriant green foliage and the branches bending down almost to the breaking point with the weight of golden fruit, aroused the enthusiasm and admiration of those who had never before seen an Ontario peach orchard. About two hours were spent driving through or past peach and other orchards, noting at the same time a few of the special insect pests of the locality, and then all returned to the hotel to meet the party of collectors, who reported a considerable number of interesting captures. Farewells were given, and the convention was at an end.

L. C.

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THE ENTOMOLOGICAL RECORD, 1913.

ARTHUR GIBSON, CHIEF ASSISTANT ENTOMOLOGIST, DIVISION OF ENTOMOLOGY, OTTAWA.

The season of 1913, in most parts of Canada, has been favorable for systematic work in entomology. In many districts the cold, backward spring was followed by perfect weather for collecting, and in consequence, in many localities, interest was awakened which resulted in valuable work being accomplished. In British Columbia, largely through the revival of the B.C. Branch of the Entomological Society of Ontario, collections were made at several points; throughout the prairie provinces new collectors were heard from, and in the older settled districts of eastern Canada, entomologists took advantage of the continued favorable weather to gather many species, and in certain groups which had been somewhat neglected, large series of specimens were secured, which added new records and much information as to distribution. At the field stations of the Division of Entomology, which have been recently established in the different provinces, the officers in charge have made collections of insects in their respective districts and these will be added to from year to year, and the material worked up by specialists.

During 1913, as far as we know, no special expeditions were made to Canada for the purpose of collecting insects. Small collections were made in the Yukon Territory and other distant places, by members of Dominion Government survey parties. Dr. E. M. Walker, of Toronto, made a collecting trip, particularly to certain parts of British Columbia and brought back many specimens. Some of the officers of the Division of Entomology while visiting western Canada officially, gathered material at various points. Dr. C. Gordon Hewitt collected ants and bees and new records were obtained. Mr. J. M. Swaine spent July, August and September in British Columbia and made important collections of certain groups of coleoptera. The writer collected interesting species in Manitoba, Alberta and British Columbia.

It is again our pleasant duty to acknowledge the continued assistance received in the determination of material from the recognized authorities in the United States and elsewhere. Particular acknowledgment is due to Dr. L. O. Howard and his associates at Washington—Dr. Dyar, Dr. Banks, Messrs. Schwarz, Crawford, Busck, Rohwer and Knab; Sir George F. Hampson of the British Museum; Mr. W. D. Kearfott, of Montclair, N.J.; Prof. H. F. Wickham, of Iowa City, Iowa; Mr. E. P. Van Duzee, of San Diego, Cal.; Mr. J. A. Grossbeck, of New York; Dr. Henry Skinner, of Philadelphia, Pa.; Dr. E. M. Walker, of Toronto, Ont.; Col. Thos. L. Casey, of Washington, D.C.; Mr. C. W. Johnson, Boston, Mass.; Mr. Chas. Liebeck, of Philadelphia, Pa.; Mr. F. H. Wolley-Dod, of Midnapore, Alta.; Mr. J. D. Evans, of Trenton, Ont.; Prof. H. S. Hine, of Columbus, Ohio; Mr. Chas. W. Leng, New York, N.Y.; Prof. J. M. Aldrich, La Fayette, Ind., and Dr. W. G. Dietz, of Hazleton, Pa.

LITERATURE.

Among the publications which have been issued during 1913, and which are of interest to Canadian students, mention may be made of the following:—

AULMANN, G. Psyllidarum catalogus: W. Junk, Berlin, 1913. We are glad to see a catalogue of the Homopterous family Psyllidæ, published by the well

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known firm of W. Junk, Berlin. It is gotten up in the same style as the Coleopterorum catalogus, which is now becoming familiar to coleopterists. This catalogue includes the species of the world and is complete in 92 pages. It will certainly prove of value to students of that family and they should know of its existence.—*Entomological News*, March, 1913.

BARNES, W., and MCDUNNOUGH, J. H. Contributions to the Natural History of the Lepidoptera of North America: Decatur, Ill. (to be obtained from Dr. W. Barnes). Vol. II, No. 1—Illustrations of Rare and Typical Lepidoptera (continued), 21 plates, issued March 10, 1913; Vol. II, No. 2.—The N. American species of the Liparid Genus Olene, pp. 47-76, plates 1-7, issued April 15, 1913; Vol. II, No. 3—New N. Am. Lepidoptera with notes on described species, pp. 93-146, plates 1-9. We were very glad, indeed, to receive the above additional numbers of the Contributions. They are valuable publications and the illustrations, on the whole, are excellent and very helpful.

CASEY, THOS. L. Memoirs on the Coleoptera, IV; published by the New Era Printing Company, Lancaster, Pa., issued Nov. 30, 1913, pp. 400. This fourth Memoir is divided into two parts: I.—Studies in the Cicindelidæ and Carabidæ of America; II.—Further Studies among the American Longicornia. In Part I., 186 species are described as new (10 of which are from Canada), and 56 as new subspecies; of these latter seven are from Canada. In Part II, 227 beetles are described as new species (four of these are from Canada) and 21 as new subspecies (none from Canada).

FAULL, J. H., et al. The Natural History of the Toronto Region, Ontario, Canada: The Canadian Institute, 1913, 419 pp. In this most interesting volume (received 13 Sept., 1913), chapter XIII, is devoted to Insect Galls of the Vicinity of Toronto (By Dr. A. Cosens), and chapter XXII to Insects and their Allies (By Dr. E. M. Walker). In this latter chapter, which occupies pages 295 to 403, lists are presented of insects, in the various orders, which are known to have been collected in the district of Toronto. Altogether 2,488 species are listed, as follows: Orthoptera 61; Dermatoptera 1; Plecoptera 2; Ephemerida 12; Odonata 60; Hemiptera 92; Neuroptera 8; Trichoptera 5; Coleoptera 1,079; Lepidoptera 619; Hymenoptera 263; Diptera 249. Unfortunately, entomologists are few in Toronto, and comparatively little systematic collecting has been accomplished outside of two or three of the better known orders, and even in these the work has been confined largely to certain families. The lists presented are of much value and will it is hoped lead to greater zeal in collecting so that many additions may be made.

FOLSOM, J. W. Entomology with special reference to its Biological and Economic Aspects; Second Revised Edition, with four plates and 304 text figures, Philadelphia: P. Blakeston's Son & Co., 1913; price $2.25.

The new revision of this very useful book contains only 402 pages as compared with 485 pages in the first edition. This is due to the fact that the type form has been enlarged to 4½ x 7 inches; the paper is also a little thinner. Much additional information is given in the new volume. Chapters I to VI remain with the same titles; chapter VII on "Origin of Adaptations and of Species" is omitted; chapters VIII and IX, correspond to VII and VIII of the new edition; in the latter, chapter IX "Transmission of Diseases by Insects" is new; chapters X, XI, XII and XIII remain with the same titles. Additions have been made to the bibliography at the end of the volume. The coloured plate illustrating protective mimicry among butterflies does not appear in the Revision.

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FRANKLIN, HENRY J. The Bombidæ of the New World: Trans. Amer. Ent. Soc. XXXVIII, pp. 177-486 (issued Jan., 1913); XXXIX, pp. 73-200, plates I-XXII (issued July, 1913). This extremely valuable monograph, the appearance of which has been eagerly looked forward to, is now available for students of the hymenoptera. Chapters on "Characters of the Bombidæ," "Geographical Distribution," "Climatic Variations," "Economic Importance," "External Anatomy," etc., precede the systematic discussion of the species. The first part treats of "Species north of Mexico," and the second, "Species south of the United States." In Part I, four species are described as new and one as a new subspecies; one of the new species is from Newfoundland. Thirty-seven species of Bombidæ occur north of the United States.

GROSSBECK, JOHN A. Bibliography of the published writings of Professor John B. Smith. Proceedings of the Staten Island Association of Arts and Sciences, Vol. IV. A copy of this bibliography has recently been received. Students of Lepidoptera will welcome this list of the writings of our late friend. In this order alone 144 references are given to published papers.

HAMPSON, SIR GEORGE F. (Bart.). Catalogue of the Lepidoptera Phalænæ in the British Museum, Vol. XII, Noctuidæ, 1913, 626 pp., plates cxcii-ccxxi, received 18th March, 1913. In this volume the subfamily Catocalinæ (in part) is classified; 63 genera embracing 643 species are presented; these are characterized as follows: "Vein 5 of the hind wing is fully developed and arises from close to the lower angle of the cell; the eyes are smooth and not overhung by 'cilia'; the mid tibiæ are always spined, and the fore and hind tibiæ may also be similarly armed." This volume is of much value to North American students, including as it does many species known in American literature under the genus *Catocala*. Records of 109 species from North America are given, 35 of which are from Canada. The beautiful plates which accompany the volume are excellent in every way.

HEWITT, C. GORDON. Bibliography of Canadian Entomology for 1911: Ottawa; Trans. Royal Soc. of Can., Third Series—1912, Vol. VI, Section IV. This useful annual publication, which is now compiled by Dr. Hewitt, will be found of much interest especially to Canadian workers. References to 116 papers are given. A new addition is the subject index which appears at the beginning.

HOWARD, L. O., DYAR, H. G. and KNAB, F. The Mosquitoes of North and Central America and the West Indies: Washington, D. C., published by the Carnegie Institution of Washington. Volume One: A general consideration of Mosquitoes, Their Habits and Their Relations to the Human Species; issued Jan. 21, 1913. Volume Two: Plates; issued Feb. 24, 1913. It is impossible in the space available here to more than simply note the appearance of the first two volumes of this monumental work on mosquitoes. Volume One consists of 520 pages. Immediately following the introduction, the "Early accounts of Mosquitoes" are discussed, followed by chapters on the structure of the adult, the larva, etc. Extensive chapters on collecting, etc., the relation of mosquitoes to man, economic loss from mosquitoes, examples of mosquito control, etc., contain most valuable and exceedingly interesting matter. The arrangement of the text, the illustrations, etc., are excellent in every way. Volume Two consists entirely of plates, to the number of 150. Plate 1 shows a diagram of culicid larvæ; plates 2-40 illustrate the male genitalia of 270 species; plate 41 shows the wings of 22 species of anophelines; plates 42-85 illustrate mature larvæ; plates 86-129, details of larvæ;

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plate 130, larval float-hairs; plate 131, head of larva, ventral view; plates 132-135, maxillæ of larvæ; plates 136-138, mandibles of larvæ; plates 139-144, mental plates of larvæ; plates 145-147, eggs; plates 148-150, pupæ.

METCALF, C. L. The Syrphidæ of Ohio: Ohio Biological Survey, Bulletin No. 1, Vol. I.; Ohio State University, Columbus, 1913, pp. 7-122, plates i to xi. This extremely valuable contribution is very welcome. The insects of this family are of very considerable economic importance. The paper is divided into three parts: Part I.—General discussion of the family, characters, etc.; Part II.—Key to known larvæ, synopsis of life-history studies, etc.; Part III.—Keys to genera, species, etc. This bulletin will be of special use to Ontario students.

MORLEY, CLAUDE. A Revision of the Ichneumonidæ based on the Collection in the British Museum (Natural History) with Descriptions of New Genera and Species: British Museum (Natural History), 1913. Part II., Tribes Rhyssides, Echthromorphides, Anomalides and Paniscides; pp. 140, 1 plate (coloured). This is a continuation of the "Revision" commenced by the same author in 1912. In this second part 291 species are included, 71 of which are described as new. Records are given of 7 species from Canada, which are in the British Museum; 2 of these are described as new. Among the North American species treated of, several not represented in the British Museum occur in Canada.

WHEELER, WILLIAM MORTON. A Revision of the Ants of the Genus Formica (Linné) Mayr; Bulletin of the Museum of Comparative Zoology, Vol. LIII, No. 10, Cambridge, Mass., October, 1913. In this most useful contribution, pp. 379-565, the author recognizes 31 species, 19 subspecies, and 43 varieties as belonging to the North American fauna. Many Canadian records are given, and several species, subspecies, and varieties are described as new. One form which occurs in Canada is given specific rank. The taxonomic and other notes given after many of the descriptions will be found of much value to students of these insects. In order to facilitate the identification of the various species, subspecies, and varieties of Formica the author gives dictotomic tables of the worker phases, as well as tables of the females of the *rufa* and *microgyna* groups.

The following is a list of the names and addresses of collectors heard from during 1913:

Anderson, E. M., Provincial Museum, Victoria, B.C.
Baird, Thos., High River, Alta.
Beaulieu, G., Experimental Farm, Ottawa.
Beaulne, J. I., Experimental Farm, Ottawa.
Bethune, Rev. Prof., O.A.C., Guelph.
Blackmore, E. H., Victoria, B.C.
Brimley, J. F., Grimsby, Ont.
Brittain, W., Agric. College, Truro, N.S.
Bush, A. H., 1105 Broadway, Vancouver, B.C.
Caesar, L., O.A.C., Guelph, Ont.
Chagnon, Gus., Box 521, Montreal.
Chagnon, W., St. John's, Que.
Chandler, Frank S., Kaslo, B.C.
Cockle, J. W., Kaslo, B.C.

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Cosens, Dr. A., Parkdale Collegiate Institute, Toronto.
Crew, R. J., 561 Carlaw Ave., Toronto.
Criddle, Evelyn, Aweme, Man.
Criddle, Norman, Aweme, Man.
Dawson, Horace, Hymers, Ont.
Day, G. O., Duncans, B.C.
Dod, F. H. Wolley-, Midnapore, Alta.
Emile, Rev. Bro., Longueuil, Que.
Evans, J. D., Trenton, Ont.
Fyles, Rev. Dr. T. W., 368 Frank St., Ottawa.
Germain, Rev. Bro., 125 Empress St., Ottawa.
Gibson, Arthur, Experimental Farm, Ottawa.
Hahn, Paul, 433 Indian Road, Toronto.
Haight, D. H., Sudbury, Ont.
Hanham, A. W., Duncans, B.C.
Harrington, W. H., P. O. Dept., Ottawa.
Heath, E. F., Cartwright, Man.
Hewitt, Dr. C. Gordon, Experimental Farm, Ottawa.
Hudson, H. F., Strathroy, Ont.
Keen, Rev. J. H., Metlakatla, B.C.
Kitto, V., Inland Revenue, Dept. Interior, Ottawa.
Leavitt, A. G., St. John, N.B.
Lyman, H. H., 74 McTavish St., Montreal.
McIntosh, W., St. John, N.B.
Mignault, Rev. J. B., Ste. Therese, Que.
Moore, G. A., 850 St. Hubert St., Montreal.
Metcalfe, W., 134 O'Connor St., Ottawa.
Nicholls, Arch., Sault Ste. Marie, Ont.
Perrin, Jos., McNab's Island, Halifax, N.S.
Petch, C. E., Covey Hill, Que.
Richard, Rev. A. E., Perkins, Que.
Ross, W. A., Vineland Station, Ont.
Sanders, G. E., Bridgetown, N.S.
Sanson, N. B., Banff, Alta.
Simpson, W., Dominion Observatory, Ottawa.
Simms, H. M., 192 Ontario East, Montreal.
Sladen, F. W. L., Experimental Farm, Ottawa.
Stewart, G. M., 83 Smith St., Winnipeg, Man.
Strickland, E. H., Experimental Station, Lethbridge, Alta.
Swaine, J. M., Experimental Farm, Ottawa.
Tothill, J. D., Fredericton, N.B.
Treherne, R. C., Agassiz, B.C.
Venables, E. P., Vernon, B.C.
Walker, Dr. E. M., Univ. of Toronto, Toronto.
Wallis, J. B., Machray School, Winnipeg, Man.
Willing, Prof. T. N., Univ. of Saskatchewan, Saskatoon, Sask.
Wilson, Tom, 1105 Broadway, Vancouver, B.C.
Winn, A. F., 32 Springfield Ave., Westmount, Que.
Young, C. H., Victoria Memorial Museum, Ottawa.

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NOTES OF CAPTURES.

(Species preceded by an asterisk (*) described during 1913.)

LEPIDOPTERA.

(Arranged according to Dyar's List of North American Lepidoptera, U.S. Nat. Museum Bull. No. 52.)

(Dyar's number.)

65. *Eurymus eurytheme* Bdv. McNab's Island, Halifax, N.S., Oct. 25, 1912; first record for the district, (Perrin).
134. *Brenthis triclaris* Hbn. Prince Albert, Sask., June 26, (Walker).
869. *Neoarctia yarrowi* Stretch. Banff, Alta., 7,500 ft. elevation on Sulphur Mt., July 9, (Sanson).
878. *Apantesis parthenice* Kirby. A perfect specimen of this species with yellow hind-wings was received from Mr. Norman Criddle, taken at Aweme, Man., Aug. 12. This is the only specimen of this species which I have seen with yellow secondaries, (A. G.).
1021. *Apatela marmorata*. Sm. Duncan, Vanc. Is., B.C., (Day). New to British Columbia..
1084. *Catabena lineolata* Walk. Cartwright, Man., first I have taken, (Heath).
1147. *Hillia discinigra* Walk. Montreal, Que., Sept. 21, 1912, (Winn). New to Quebec list.
1224. *Hadena finitima* Gn. Quamichan Lake, B.C., May 22, a pair at sugar; the first specimens taken here, (Hanham).
1254. *Epidemas cinerea* Sm. Victoria, B.C., Oct. 2, (Hanham).
1269. *Polia extincta* Sm. Cartwright, Man., Aug. 1, (Heath).
1273. *Polia contadina* Sm. Quamichan Lake, B.C., Sept. 15, (Hanham).
1289. *Trachea delicata* Grt. St. John's, Que., July 16, (W. Chagnon); Montreal (Aug.) only record in Winn's Quebec list.
1335. *Oncocnemis homogena* Grt. Hope Mountains, B.C., July 26, 1908, (Day). New to British Columbia.
1419. *Platagrotis condita* Gn. Quamichan Lake, B.C., May 26, (Hanham).
1500. *Noctua havilæ* Grt. Duncan, Van. Is., B.C., (Day). New to British Columbia.
1588. *Paragrotis brocha* Morr. Duncan, Vanc. Is., B.C., (Day).
1593. *Paragrotis hollemani* Grt. Duncan, Vanc. Is., B.C., (Day). New to Canada.
1702. *Paragrotis infausta* Walk. Quamichan Lake, B.C., Aug. 13, Sept. 1, (Hanham).
1740. *Paragrotis pinder* Sm. Quamichan Lake, B.C., Sept. 9, (Hanham).
* *Mamestra mutata* Dod. Calgary, Alta., June 22-Aug. 9, (Dod); Mineota, Cartwright, Winnipeg, Man., Aug. 3-Sept. 20, (Dennis, Heath and Hanham); Can. Ent. Vol. XLV, 29.
2185. *Papaipema unimoda* Sm. Cartwright, Man., Sept. 5, (Heath).
2210. *Pseudoglœa blanda* Grt. Duncan, Vanc. Is., B.C., (Day).
* *Parastichtis lignicolora atriclava* B. & McD. Duncan, Vanc. Is., B.C., (Hanham); Contributions to the Nat. Hist. of the Lep. of N. A., Vol. II, No. 3, issued April 15, 1913.

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* *Parastichtis purpurissata* B. & McD. Duncan, Vanc. Is., B.C., (Hanham). Contributions to the Nat. Hist of the Lep. of N. A., Vol. II, No. 3, issued April 15, 1913.

2241. *Scopelosoma devia* Grt. Bridgetown, N.S., April 15 (Sanders).

2617. *Eustrotia includens,* Wlk. Cartwright, Man., July 25, (Heath).

2977. *Pheocyma horrida* Hbn. Ste. Therese Island, near St. John's, Que., July 1, (W. Chagnon). New to Quebec list.

3002. *Pheocyma duplicata* Bethune. Bridgetown, N.S., June 28, (Sanders).

* *Olene vagans vagans* B. & McD. St. John's, Que., July 1 and 11 (Chagnon); Windsor Mills, Que., July 4, (Winn); Contributions to the Nat. Hist. of the Lep. of N. A., Vol. II, No. 2, April 15, 1913. New to Quebec list.

* *Olene vagans grisea* B. & McD. Cartwright, Man., (Heath); Pincher, Alta., (Willing); Kaslo B.C., July 8-20, (Cockle); Contributions to the Nat. Hist. of the Lep. of N. A., Vol. II, No. 2, April 15, 1913.

* *Olene vagans willingi* B. & McD. Humbolt, Sask., June 13 and 27, (Willing); Hymers, Ont., (Dawson); Contributions to the Nat. Hist. of the Lep. of N. A., Vol. II, No. 2, April 15, 1913.

Olene pini Dyar. St. John's, Que., (Chagnon). New to Quebec list.

3353. *Eustroma nubilata* Pack. St. John's, Que., July 1, (W. Chagnon); Rimouski, (Aug.), only record in Winn's Quebec list.

Mesoleuca walkerata Pearsall. Newaygo, Laurentian Mts., Que., July 5, (G. A. Southee). New to Quebec list.

Hydriomena transfigurata Swett. Nipigon, Ont., June 18, (Walker).

* *Ania limbaria* var. *chagnoni* Swett. Ste. Therese Isle, St. John's, Que., July 9, 1912, (Chagnon); Can. Ent., Vol. XLV, 76.

4211. *Sesia novaroensis* Hy. Edw. Victoria, B.C., Aug. 7, 1911, (Blackmore); Departure Bay, B.C., July 24, (Walker).

4587. *Crambus ruricolellus* Zell. Bridgetown, N.S., Aug. 19, (Sanders).

4802. *Megasis atrella* Hulst. Cartwright, Man, May 16, (Heath).

5033. *Olethreutes capreana* Hbn. Ottawa, July 15, 1902, (J. Fletcher).

5045. *Olethreutes roseomaculana* H. S. High River, Alta., July 7, 1907, (Baird).

5047. *Oleuthreutes chionosema* Zell. Guelph, Ont., (Caesar).

5142. *Eucosoma otiosana* Clem. Bridgetown, N.S., Aug. 8, 1912, (Sanders).

5143. *Eucosoma similana* Hbn. Bridgetown, N.S., Sept. 2, 1912, (Sanders).

5335. *Cenopis reticulana* Clem. Bridgetown, N.S., Aug. 16, (Sanders).

5348. *Sparganothis puritana* Rob. Cartwright, Man., July 12, (Heath).

5391. *Pandemis limitana* Rob. Bridgetown, N.S., Aug. 15, (Sanders).

5396. *Tortrix pallorana* var. *nervosana* Kearf. Bridgetown, N.S., Aug. 9, 1912, (Sanders).

5489. *Periclymenobius dentiferellus* Wlsm. Cartwright, Man., Aug. 26, (Heath).

5868. *Depressaria klamathiana* Wlsm. Ottawa, Sept. 11, 1908, (J. Fletcher).

5893. *Semioscopsis packardella* Clem. Cartwright, April 28, (Heath).

5895. *Semioscopsis inornata* Wlsm. Cartwright, Man., April 11, (Heath).

6514. *Tinea misella* Zell. Ottawa, June 18, 1906, (J. Fletcher).

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COLEOPTERA.

(Arranged according to Henshaw's list of the Coleoptera of America, North of Mexico.)

Omophron concinnum Csy. Rare in damp sandy stretches along the Cowichan River, near Duncan, Vanc. Is., B.C., May, (Hanham).

86. *Cychrus elevatus* Fab. Birds Hill, (near Winnipeg), Man., May 24, (Hanham).

Carabus nemoralis, Mull. Montreal, Que., June 26, (Bro. Germain). In the Can. Ent., Vol. 24, 112, Mr. W. H. Harrington records this species as well as *C. granulatus* Dej., from St. John, N.B. Mr. G. Beaulieu has also taken *C. nemoralis* at this latter place. (See also Ent. Rec. 1901). The occurrence of the species on Mount Royal, Montreal, is of interest.

* *Cicindela montana canadensis* Csy. Calgary, Alta.

* *Cicindela spissitarsis* Csy. Aweme, Man., (N. Criddle).

* *Cicindela criddlei* Csy. Aweme, Man., (N. Criddle).

* *Cicindela limbigera nympha* Csy. Aweme, Man., (N. Criddle).

* *Cicindela limbalis awemeana* Csy. Aweme, Man., (N. Criddle).

* *Cicindela decemnotata albertina* Csy. Lethbridge, Alta.

* *Cicindela venusta versuta* Csy. Aweme, Man., (N. Criddle).

* *Cicindela kirbyi* Csy. Aweme, Man., (N. Criddle).

* *Cicindela bucolica* Csy. Aweme, Man., (N. Criddle).

The above new species and new subspecies are described in Memoirs on the Coleoptera, IV, by Thos. L. Casey, issued Nov. 30, 1913.

155. *Elaphrus fuliginosus* Say. Aylmer, Que., July 13, (Bro. Germain).

156. *Elaphrus lecontei* Cr. Winnipeg, Man., June 17, 1911, (Wallis).

164. *Blethisa quadricollis* Hald. Longueuil, Que., May, (Bro. Emile).

173. *Notiophilus æneus* Hbst. Ottawa, Nov. 1, 1902, (Harrington).

178. *Notiophilus sibiricus* Mots. Ottawa, April 13, 1883, (Harrington); Kingsmere, Que., (Simpson).

* *Leistus nigropiceus* Csy. Metlakatla, B.C., (Keen); Memoirs on the Coleoptera, IV, Nov. 30, 1913, by Thos. L. Casey.

* *Nebria columbiana* Csy. Inverness, B.C., (Keen); Memoirs on the Coleoptera, IV, Nov. 30, 1913, by Thos. L. Casey.

* *Nebria testaceipes* Csy. "British Columbia: Glenora," (Wickham); Memoirs on the Coleoptera, IV, Nov. 30, 1913, by Thos. L. Casey.

191. *Nebria obtusa* Lec. Lethbridge, Alta., Aug. 21, 1912, (Wallis).

262. *Clivina punctulata* Lec. Duncan, Vanc. Is., early in spring, along the Cowichan River, (Hanham).

316. *Bembidium bifossulatum* Lec. Brandon, Man., rare, Oct. 8, (Hanham).

322. *Bembidium longulum* Lec. Winnipeg, Man., Oct. 24, 1911, (Wallis).

337. *Bembidium 4-foveolatum* Mann. Peachland, B.C., July 12, 1912, (Wallis).

349. *Bembidium bimaculatum* Kirby. Husavick, Man., July 24, 1912, (E. (Coates).

375. *Bembidium indistinctum* Dej. Victoria, B.C., July 4, 1912, (Wallis).

380. *Bembidium variolosum* Mots. Lethbridge, Alta., July 21, 1912, (Wallis).

462. *Tachys granarius* Dej. Winnipeg, Man., June 6, 1911, (Wallis).

483. *Trechus chalybeus* Mann. Selkirk, Man., June 10, 1911 (Wallis).

509. *Pterostichus castaneus* Dej. Mt. Arrowsmith, 4,500 ft. elevation, June 26, (Hanham).

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567. *Pterostichus convexicollis* Say. Hull, Que., April 27; Aylmer, Que., May 11; Ottawa, April 26, (Beaulne).

* *Holciophorus vancouveri* Csy. Victoria, Vanc. Is., B.C.; Memoirs on the Coleoptera, IV, Nov. 30, 1913, by Thos. L. Casey.

* *Pterostichus novellus* Csy. "Vancouver Island"; Memoirs on the Coleoptera, IV, Nov. 30, 1913, by Thos. L. Casey.

* *Pterostichus metlakatlæ* Csy. Metlakatla, B.C., (Keen); Memoirs on the Coleoptera, IV, Nov. 30, 1913, by Thos. L. Casey.

* *Pterostichus scenicus* Csy. "British Columbia"; Memoirs on the Coleoptera, IV, Nov. 30, 1913, by Thos. L. Casey.

* *Calathus labradorinus* Csy. West St. Modest, Labrador; Memoirs on the Coleoptera, IV, Nov. 30, 1913, by Thos. L. Casey.

667. *Amara protensa* Putz. Ottawa, April 23, (Beaulne).

678. *Amara remotestriata* Dej. Ottawa, Aug. 16, (Beaulne).

821. *Platynus bogemanni* Gyll. Vernon, B.C., (Brittain).

822. *Platynus quadripunctatus* DeG. Under logs on sandy banks of Cowichan River, near Duncan, Vanc. Is., B.C., Nov. 8, (Hanham).

823. *Platynus bembidioides* Kirby. Duncan, Vanc. Is., only two specimens taken in British Columbia, in 12 years, (Hanham).

851. *Galerita janus* Fab. Montreal, Que., Nov. 12, 1899, (Beaulieu).

852. *Galerita lecontei* Dej. Winnipeg, Man., Oct. 4, 1912, (Wallis).

884. *Lebia pleuritica* Lec. Winnipeg, Man., June 13, 1912, (Wallis).

898. *Lebia depicta* Horn. Lethbridge, Alta., Aug. 23, 1912, on solidago, (Wallis).

915. *Axinopalpus biplagiatus* Dej. Victoria, B.C., Oct. 15, (Hanham).

1021. *Chlænius pennsylvanicus* Say. Swan Lake, B.C., appears to be rare species in Brit. Col., only one specimen taken, June, (Hanham).

1031. *Chlænius purpuricollis* Rand. Brandon, Man., (Hanham).

1060. *Agonoderus infuscatus* Dej. Ottawa, May 3, (Bro. Germain).

1118. *Harpalus varicornis* Lec. Ottawa, May 14, (Beaulne).

1137. *Stenolophus anceps* Lec. Cowichan River, near Duncan, Vanc. Is., B.C., under logs, Nov. 8, (Hanham).

1166. *Tachycellus atrimedius* Say. Winnipeg, Man., (Hanham).

1222. *Haliplus borealis* Lec. Ottawa, Sept. 21, (Beaulne).

* *Haliplus subguttatus* Robert. Antigonish, N.S., (Swaine); Montreal, Que., (Chagnon); Aweme, Man., (N. Criddle); Peachland, B.C., Husavick and Winnipeg, Man., (Wallis); Jour. N. Y. Ent. Soc. Vol. XXI, June, 1913.

* *Haliplus strigatus* Roberts. Treesbank and Stony Mt., Man., (Wallis); Aweme, Man., (N. Criddle); Frazer Valley, B.C., (G. Weidt); Jour. N. Y. Ent. Soc. Vol. xxi, June, 1913.

* *Peltodytes tortulosus* Roberts. Winnipeg Beach, Man., (Wallis); Aweme, Man., (N. Criddle); Jour. N. Y. Ent. Soc. Vol. XXI, June, 1913.

1233. *Cnemidotus edentulus* Lec. Ottawa, Sept. 23, (Beaulne).

1378. *Ilybius ater* DeG. Ottawa, June 28, (Beaulne).

1385. *Ilybius ignarus* Lec. Ottawa, June 11, (Beaulne).

(9300) *Agabus confinis* Gyll. Ottawa, June 20, (Bro. Germain).

1466. *Rhantus bistriatus* Bergst. Ottawa, July 18, (Bro. Germain); July 9, 1912, (Beaulne).

1478. *Hydaticus lævipennis* Thom. Ottawa, June 12, (Bro. Germain).

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1493. *Acilius fraternus* Harr. Lake Abitibi, Ont., Aug. 26, (W. S. Odell).
1496. *Thermonectes basilaris* Harr. Hull, Que., Nov. 2, (Beaulne).
1579. *Ochthebius holmbergi* Makl. Winnipeg, Man., May 20, 1910, (Wallis).
1589. *Hydrophilus nimbatus* Say. Winnipeg Beach, Man., Aug. 5, 1910, (Wallis); Ottawa, June 3, (Bro. Germain).
1724. *Catoptrichus frankenhaeuseri* Mann. Duncan, B.C., (Hanham).
2004. *Fagaria venustula* Er. E. Ont., (Evans).
Atheta fungi Grav. Ottawa, June 13, (Beaulne).
Atheta sordida Marsh. Ottawa, Aug. 21, (Beaulne).
Aleochara defecta Csy. Ottawa, Aug. 14, (Beaulne).
(9557) *Aleochara morion* Grav. Ottawa, Aug. 21, (Beaulne).
Aleochara thoracica Csy. Ont., (Evans).
Oxypoda demissa Csy. E. Ont., (Evans).
Oxypoda orbicollis Csy. E. Ont., 1884, (Evans).
Oxypoda tenuicula Csy. E. Ont., (Evans).
Oxypoda stygica Csy. Trenton, Ont., Sept. 23, 1904, (Evans).
Pasilia virginica Csy. E. Ont., (Evans).
Micrearota reperta Csy. E. Ont., (Evans).
Datomicra vaciva Csy. E. Ont., 1884, (Evans).
Acrotona adjuvans Csy. E. Ont., (Evans).
Traumecia tenuicula Csy. E. Ont., (Evans).
Coprothassa sordida Marsh. E. Ont., Sept. 1883, (Evans).
2079. *Gyrophæna flavicornis* Mels. Ont., (Evans).
2326. *Stenus scrupeus* Csy. E. Ont., (Evans).
2364. *Stenus pusia* Csy. E. Ont., (Evans).
2389. *Stenus vinnulus* Csy. E. Ont., 1886, (Evans).
2401. *Stenus juvencus* Csy. E. Ont., (Evans).
2451. *Stenus canadensis* Csy. E. Ont., (Evans).
(9745) *Trogophlœus temporalis* Csy. Trenton, Ont., Sept. 24, 1904, (Evans).
3071. ***Harmonia* 14-*guttata* Linn. Aweme, Man., on *Acer negundo*, June, (E. Criddle).**
3421. *Dermestes talpinus* Mann. Ottawa, May 19, (Bro. Germain).
(9944) *Hister electus* Csy. Victoria, B.C., in moss on large boulder, late in fall, (Hanham).
3665. *Cercus pennatus* Murr. Ottawa, June, (Bro. Germain).
3725. *Prometopia* 6-*maculata* Say. Ottawa, June 29, (Beaulne); Montreal, Que., June, (Beaulieu).
3898. *Syncalypta echinata* Lec. Brandon, Man., under stones on hilltops, (Hanham).
3971. *Macropogon testaceipennis* Mots. Mt. Tzouhalem, Vanc. Is., B.C., June 14, (Hanham).
(10021) *Melasis rufipennis* Horn. Quamichan, B.C., flying around and alighting on stacked cord wood, June 1; never taken on any other occasion (Hanham).
4031. *Dromœolus basalis* Lec. Victoria, B.C.; Duncan, B.C., August, rare, (Hanham).
4064. *Anelastes drurii* Kirby. Aweme, Man., Aug. 25, 1905, (N. Criddle).
4074. *Adelocera pyrsolepis* Lec. Victoria, B.C., (Hanham).
4082. *Adelocera brevicornis* Lec. Aweme, Man., May, Aug., (N. Criddle).

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4083. *Adelocera profusa* Cand. Victoria, B.C., (Hanham).
4095. *Alaus melanops* Lec. Quamichan Lake, B.C., under bark of stump, March, (Hanham).
4113. *Cardiophorus tenebrosus* Lec. Quamichan Lake, B.C., (Hanham).
4143. *Cryptohypnus funebris* Cand. Cowichan River, near Duncan, B.C., (Hanham).
4148. *Cryptohypnus impressicollis* Mann. Aweme, Man., May 25, 1909, (N. (Criddle).
(10054) *Cryptohypnus caurinus* Horn. Cowichan River, near Sahtlam, B.C., June, (Hanham).
4219. *Elater mixtus* Hbst. Aweme, Man., June 22, 1904, June 27, 1905, (N. Criddle).
4237. *Elater lateralis* Lec. Quamichan Lake, B.C., Sept. 29, (Hanham).
4279. *Agriotes mancus* Say. Aweme, Man., May, 10, 1910, (N. Criddle).
4280. *Agriotes stabilis* Lec. Aweme, Man., May, June, (N. Criddle).
4320. *Melanotus castanipes* Payk. Husavick, Man., June 20, 1912, (N. Criddle).
* *Limonius venablesi* Wickham. Vernon, B.C., May 14, (Venables); Psyche, Vol. xx, 27.
4352. *Limonius discoideus* Lec. Vernon, B.C., (Brittain); Quamichan Lake, B.C., (Hanham).
4361. *Limonius æger* Lec. Aweme, Man., May 4, 1909, (N. Criddle).
4394. *Athous nigripilis* Mots. Victoria, B.C., Quamichan Lake, B.C., (Hanham).
4412. *Ostodes tenuicollis* Rand. Aweme, Man., July 20, 1910, (N. Criddle).
Corymbites sjælandicus Mull. Aweme, Man., June 19, 1909, (E. Criddle).
4427. *Corymbites vernalis* Hentz. Oak Bay, Victoria, B.C., one under bark of fallen oak tree, no other record for Brit. Col., (Hanham).
4450. *Corymbites tarsalus* Melsh. Victoria, B.C., new to my Brit. Col. list, (Hanham).
4451. *Corymbites caricinus* Germ. Aweme, Man., May, June, (N. Criddle).
4471. *Corymbites fraternus* Lec. Goldstream, B.C., (Hanham).
4480. *Corymbites propola* Lec. Aweme, Man., June, July, (N. Criddle).
4490. *Corymbites conjungens* Lec. Vernon, B.C., (Brittain).
4587. *Dicerca sexualis* Cr. Quamichan Lake, B.C., May 21, my first capture of this species (Hanham).
4592. *Trachykele blondeli* Mars. Goldstream, B.C., June 22, 1901, (Hanham).
4623. *Melanophila gentilis* Lec. Quamichan Lake, B.C., April 20, (Hanham).
(10076) *Chrysobothris caurina* Horn. Quamichan Lake, B.C., (Hanham).
4791. *Eros trilineatus* Melsh. Meach Lake, Que., July 6, (Bro. Germain).
4882. *Podabrus basilaris* Say. Ottawa, June; Wakefield, Que., July 1, (Bro. Germain).
4935. *Telephorus nigritulus* Lec. Ottawa, June, (Bro. Germain).
5245. *Eucrada humeralis* Melsh. Ottawa, June 21, (Beaulne); Mr. Harrington has also taken this species under beech bark.
5350. *Bostrychus bicornus* Web. Aylmer, Que., June 18, (Bro. Germain); Hull, Que., June 9, (Harrington).
5356. *Amphicerus bicaudatus* Say. Ottawa, May 4, (Bro. Germain).
* *Aphodius columbiensis* Wick. Vernon, B.C., (Venables); Psyche, Vol. xx, 27.
5983. *Opsimus quadrilineatus* Mann. Quamichan Lake, B.C., (Hanham).

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6094. *Hybodera tuberculata* Lec. Quamichan Lake, B.C., (Hanham).
6099. *Molorchus longicollis* Lec. Victoria, B.C., (Hanham).
6189. *Xylotrechus planifrons* Lec. Vernon, B.C., (Brittain); Quamichan Lake, B.C., (Hanham).
6219. *Atimia dorsalis* Lec. Duncan, B.C., (Hanham).
6229. *Prototrichus vitticollis* Lec. Quamichan Lake, B.C., at bloom, May, (Hanham).
6230. *Leptalia macilenta* Mann. Quamichan Lake, B.C.; Victoria, B.C., (Hanham).
6238. *Toxotus schaumii* Lec. Winnipeg, Man., June 26, (Hanham).
6239. *Toxotus flavolineatus* Lec. Goldstream, B.C.; Maple Bay, B.C.; July, (Hanham).
6241. *Toxotus virgatus* Lec. Winnipeg, Man., June 26, (Hanham).
6560. *Leptura valida* Lec. Quamichan Lake, B.C., June, (Hanham).
* *Evodinus vancouveri* Csy. "Vancouver Island"; Memoirs on the Coleoptera, IV., Nov. 30, 1913, by Thos. L. Casey.
* *Brachyleptura cuneatula* Csy. "Ontario"; Memoirs on the Coleoptera, IV., Nov. 30, 1913, by Thos. L. Casey.
* *Strangalepta keeni* Csy. Inverness, B.C., (Keen); Memoirs on the Coleoptera, IV., Nov. 30, 1913, by Thos. L. Casey.
* *Xestoleptura columbica* Csy. "British Columbia" (Keen); Memoirs on the Coleoptera, IV., Nov. 30, 1913, by Thos. L. Casey.
* *Xestoleptura vancouveri* Csy. "Vancouver Island"; Memoirs on the Coleoptera, IV., Nov. 30, 1913, by Thos. L. Casey.
6403. *Synaphoeta guexi* Lec. Victoria, B.C., July 17, (Blackmore).
6471. *Ataxia crypta* Say. Winnipeg, Man., June, July, (Hanham).
6484. *Saperda discoidea* Fab. Hull, Que., June 21, 1912, (Kitto).
6498. *Oberea schaumii* Lec. Winnipeg, Man., (Hanham).
6543. *Donacia pusilla* Say. Quamichan Lake, B.C., (Hanham).
(10337) *Syneta hamata* Horn. Cameron Lake, B.C., June 27, (Hanham).
6556. *Zengophora consanguinea* Cr. Ottawa, July 9, 1912 (Bro. Germain).
6590. *Coscinoptera dominicana* Fab. Brandon, Man.; the larvæ were taken from around nest of large red ant, alongside of railway track on April 23, and the first beetles made their appearance on May 17, (Hanham).
6804. *Chrysomela præcelsis* Rog. Birds Hill, (near Winnipeg) Man., July 1, 1899, (Hanham).
6864. *Luperus varipes* Lec. Vernon, B.C., (Brittain).
7067. *Microrhopala excavata* Oliv. Ottawa, July 9, 1912, (Bro. Germain).
7553. *Helops regulosus* Lec. Vernon, B.C., (Brittain).
7579. *Strongylium tenuicolle* Say. Montreal, Que., July 29, (Bro. Germain).
Xanthochroa testacea Horn. Quamichan Lake, B.C., end July and August, (Hanham).
7746. *Oxacis bicolor* Lec. Quamichan Lake, B.C., Aug., (Hanham).
7759. *Cephaloon tenuicorne* Lec. Cowichan Lake, B.C., June 18, (Hanham).
7777. *Mordella quadripunctata* Say. Husavick, Man., July 11, 1910, (Wallis).
7779. *Mordella melæna* Germ. Husavick, Man., July 11, 1910, (Wallis).
7783. *Mordella marginata* Melsh. Husavick, Man., July 11, 1910, (Wallis).
8002. *Meloe montanus* Lec. Quamichan Lake, B.C., (Hanham).
8011. *Meloe strigulosus* Mann. Quamichan Lake, B.C., (Hanham).

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8258. *Anametis grisea* Horn. Winnipeg, Man., on *Eleagnus argentea,* (Wallis).
* *Dyslobus bituberculatus* Pierce. "North Bend, B.C.," June 6, 7, (Hubbard and Schwarz collection); Proc. U. S. N. M., Vol. 45, 388.
* *Panscopus (Nomidus) ovalis* Pierce. Banff, Alta., June 10, (Hubbard and Schwarz); Proc. U. S. N. M., Vol. 45, 396.
8358. *Trichalophus planirostris* Lec. Winnipeg, Man., May 20, 1911, (Wallis).
8482. *Hypomolyx pinicola* Coup. Onah, Man., May 24, 1912, (Wallis).
8526. *Cleonus vittatus* Kirby. Victoria, B.C., July 4, 1912, (Wallis).
8530. *Dorytomus laticollis* Lec. Winnipeg, Man., Sept. 21, 1911, (Wallis).
8536. *Dorytomus squamosus* Lec. Aweme, Man., June 3, 10, 1902, (N. Criddle).
8575. *Endalus ovalis* Lec. Selkirk, Man., June 10, 1911, (Wallis).
8578. *Anchodemus angustus* Lec. Husavick, Man., July 11, 1910, (Wallis).
* *Magdalis austera* Fall. Ridgeway, Ont., (A. H. Kilman); Toronto, Ont.; Trans. Amer. Ent. Soc. Vol. xxxix, 29.
8615. *Magdalis barbita* Say. Aweme, Man., July 1, (E. Criddle).
8616. *Magdalis aenescens* Lec. Vernon, B.C., (Brittain).
8644. *Anthonomus musculus* Say. Aweme, Man., on *Elæagnus argentea,* June 2, (E. Criddle).
8660. *Anthonomus elongatus* Lec. Aweme, Man., June 13, 1907, (N. Criddle).
8697. *Tychius tectus* Lec. Aweme, Man., July 4, 1903, (N. Criddle).
8787. *Cryptorhynchus bisignatus* Say. Onah, Man., May 24, 1912, (Wallis).
8808. *Piazurus californicus* Lec. Peachland, B.C., July 15, 1912, (Wallis).
Balaninus pardalis Chit. Aweme, Man., June 31, 1904, reared from acorns of *Quercus macrocarpa,* (N. Criddle).

Diptera.

(Arranged according to a catalogue of North American Diptera, by J. M. Aldrich, Smithsonian Misc. Coll. XLVI., No. 1,444. The numbers refer to the pages in the catalogue).

A good deal of material in this order has been studied and determined by specialists during the year. Dr. Dietz has continued to name collections of Tipulidæ, as has also Mr. C. P. Alexander. Many of the species determined are well known, but the records are of interest to us and add to our knowledge of the distribution.

78. *Rhipidia maculata* Meig. Truro, N.S., July 26, (R. Matheson).
79. *Dicranomyia hæretica* O. S. Truro, N.S., July 13, (R. Matheson).
79. *Dicranomyia halterata* O. S. Ottawa, June 13, (Beaulne); Truro, N.S., July 7, (R. Matheson).
79. *Dicranomyia immodesta* O.S. Truro, N.S., July 13 (R. Matheson).
79. *Dicranomyia liberta* O. S. Truro, N.S., July 26; Debert, N.S., June 21, (R. Matheson).
79. *Dicranomyia longipennis* Schum. Aweme, Man., June 13, (E. Criddle).
81. *Limnobia solitaria* O. S. Truro, N.S., July 12, (R. Matheson).
83. *Antocha opalizans* O. S. Coaticook, Que., Sept. 6, (Beaulne); Truro, N.S., July 7, 26, (R. Matheson).
83. *Cryptolabis paradoxa* O. S. Truro, N.S., July 7, 12, (R. Matheson).
84. *Erioptera armata* O. S. Truro, N.S., July 7, (R. Matheson).

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84. *Erioptera armillaris* O. S. Truro, N.S., July 12, (R. Matheson).
84. *Erioptera caloptera* Say. Truro, N.S., July 7, (R. Matheson).
84. *Erioptera chlorophylla* O. S. Truro, N.S., July 7-12, (R. Matheson).
85. *Erioptera septentrionalis* O. S. Aweme, Man., June 16, (E. Criddle); Truro, N.S., July 26, (R. Matheson).
85. *Erioptera venusta* O. S. Coaticook, Que., Sept. 6, (Beaulne).
85. *Goniomyia cognatella* O. S. Aweme, Man., June 28, (E. Criddle); Truro, N.S., July 7, 12, 26, (R. Matheson).
86. *Goniomyia subcinerea* O. S. Coaticook, Que., Sept. 6, (Beaulne).
86. *Goniomyia sulphurella* O. S. Truro, N.S., July 7, 12, (R. Matheson).
Rhabdomastix flava Alex. Truro, N.S., July 12, 26, (R. Matheson).
88. *Trichocera bimacula* Walk. Ottawa, Aug., 5, 1901, (Gibson).
89. *Epiphragma fascipennis* Say. Aweme, Man., June 12-26, (E. Criddle).
89. *Limnophila adusta* O. S. Ottawa, July 4, (Beaulue); Truro, N.S., July 7, 26, (R. Matheson).
89. *Limnophila contempta* O. S. Aweme, Man., June 26, (E. Criddle); Coaticook, Que., Sept. 6, (Beaulne).
90. *Limnophila imbecilla* O. S. Aylmer, Que., June 29, (Beaulne).
90. *Limnophila inornata* O. S. Aweme, Man., June 25, (E. Criddle).
90. *Limnophila macrocera* Say. Truro, N.S., July 12, (R. Matheson).
Limnophila noveboracensis Alex. Truro, N.S., July 13, (R. Matheson).
90. *Limnophila recondita* O. S. Truro, N.S., July 13, (R. Matheson).
90. *Limnophila rufibasis* O. S. Ottawa, June 18; Aylmer, Que., June 15, (Beaulne); Aweme, Man., June 16, (E. Criddle).
90. *Limnophila tenuipes* Say. Ottawa, Sept. 9, 1900, (Gibson).
91. *Limnophila ultima* O. S. Banff, Alta., (Sanson).
92. *Eriocera longicornis* Walk. Little Current River, July 8, 1903; Nagagami River, June 20, 1903; Mamamattawa River, (Hudson Bay Slope), June 21, 1903, (W. J. Wilson).
92. *Eriocera spinosus* O. S. Truro, N.S., larva, May 19, (R. Matheson).
93. *Amalopsis calcar* O. S. Meach Lake, Que., Sept. 2, 1903, (J. Fletcher); Rostrevor, Ont., Sept. 21, 1903, (Gibson).
93. *Amalopsis inconstans* O. S. Ottawa, June 9, 1900, (Gibson); Aweme, Man., June-July (E. Criddle); Aylmer, Que., June 15, (Beaulne); Truro, N.S., July 7, (R. Matheson).
93. *Amalopsis vernalis* O. S. Truro, N.S., July 12, (R. Matheson).
94. *Pedicia albivitta* Walk. Londonderry, N.S., (Faribault).
94. *Liogma nodicornis* O. S. Aweme, Man., June 16-25, (E. Criddle).
95. *Bittacomorpha clavipes* Fab. Ottawa, Sept. 12, 1908, (J. A. Letourneau); Aug. 27, 1911 (Gibson); Massett, Q.C.I., Br. Col., (Keen); Truro, N.S., May 24, (R. Matheson)
Oropeza albipes John. Aweme, Man., June, (E. Criddle).
Oropeza sayi John. Aweme, Man., June 23, (E. Criddle).
97. *Ctenophora angustipennis* Loew. Aweme, Man., June 25, (E. Criddle); Duncan, B.C., April 24, 1904, (Hanham).
97. *Pachyrhina eucera* Loew. Truro, N.S., July 7, (R, Matheson).
98. *Pachyrhina ferruginea* Fab. Prince Albert, Sask., July 27, (J. Fletcher); Truro, N.S., July 12, 26, (R. Matheson).
98. *Pachyrhina incurva* Loew. Aweme, Man., July 7, (E. Criddle); Aylmer, Que., June 29, (Beaulne); Ottawa, June 15, 1906, (J. Fletcher); Truro, N.S., July 26, (R. Matheson).

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98. *Pachyrhina occipitalis* Loew. Coaticook, Que., Sept. 8, (Beaulne).
98. *Pachyrhina pedunculata* Loew. Ottawa, July 4, (Beaulne); Ottawa, June 28, 1906, (Gibson); Truro, N.S., July 13, (R. Matheson).
98. *Pachyrhina sodalis* Loew. Aweme, Man., June 25, (E. Criddle).
99. *Pachyrhina tenuis* Loew. Ottawa, June 18, (Beaulne); Truro, N.S., July 7, (R. Matheson).
100. *Tipula abdominalis* Say. Truro, N.S., July 7, Aug. 7, (R. Matheson).
100. *Tipula angulata* Loew. Aylmer, Que., June 24, (Beaulne).
100. *Tipula angustipennis* Loew. Chelsea, Que., May 30, 1908, (J. Fletcher); Kalso, B.C., May 24, (Cockle); Banff, Alta., (Sanson).
100. *Tipula apicalis* Loew. Ottawa, July 4, (Beaulne); Truro, N.S., July 7, (R. Matheson).
101. *Tipula bicornis* Loew.MS. Ottawa, June 18, (Beaulne).
101. *Tipula caloptera* Loew. Middleton, N.S., May 27, 1911, (Coll. unknown); Truro, N.S., July 12, 13, (R. Matheson).
102. *Tipula fasciata* Loew. Truro, N.S., July 12, (R. Matheson).
102. *Tipula grata* Loew. Aylmer, Que., June 24; Ottawa, July 11, (Beaulne).
102. *Tipula hebes* Loew. Truro, N.S., July 12-26, (R. Matheson).
103. *Tipula macrolabis* Loew. Aylmer, Que., June 24, (Beaulne); Aweme, Man., June 25, (E. Criddle).
103. *Tipula megaura* Doane. Ottawa, June 28; Aylmer, Que., June 29, (Beaulne).
103. *Tipula platymera* Walk. Banff, Alta., (Sanson).
104. *Tipula tephrocephala* Loew. Aweme, Man., June 31, (E. Criddle); Ottawa, June 19; Aylmer, Que., June 15, (Beaulne).
104. *Tipula tessellata* Loew. Banff, Alta., (Sanson).
104. *Tipula trivittata* Say. Truro, N.S., July 7, (R. Matheson).
105. *Tipula valida* Loew. Aylmer, Que., June 15; Ottawa, June 18, (Beaulne).
126. *Theobaldia incidens* Thom. Old Crow River, Y.T., June 1, 1912, (J. M. Jessup).
149. *Sciara coprophila* Lint. St. Catharines, Ont., (W. A. McCubbin).
* *Cystiphora canadensis* Felt. Toronto, Ont., reared July 10, (Cosens); Can. Ent. XLV., 417.
166. *Bibio femoratus* Wied. Montreal, Que., Aug. 16, 1906, (Beaulieu).
169. *Simulium hirtipes* Fries. St. Hilaire, Que., May 24, 1906, (Beaulieu).
170. *Simulium pictipes* Hagen. Ottawa, July 30, 1912, (Beaulieu).
170. *Simulium venustum* Say. Rampart House, Y.T., Aug. 20-29; Old Crow River, Y.T., Aug. 20-23, 1912; Long. 141, Lat. 69-10, Aug. 14-17, 1912, (J. M. Jessup).
174. *Allognosta obscuriventris* Loew. Ottawa, July 2, 1912, (Beaulieu).
182. *Stratiomyia apicula* Loew. Aweme, Man., June and August, 1912, (N. Criddle).
188. *Euparyphus limbocutris* Will. Aweme, Man., July 11, 1911, (E. Criddle).
189. *Euparyphus tetraspilus* Loew. Aweme, Man., July 11, 1911. (E. Criddle).
189. *Nemotelus canadensis* Loew. Aweme, Man., June 15, 1911, (E. Criddle).
190. *Nemotelus glaber* Loew. Ottawa, July 2, 1912, (Beaulieu).
196. *Chrysops frigidus* O. S. Youghall, N.B., July 3, 1908, (Gibson).
196. *Chrysops indus* O. S. Mer Bleue, Carlsbad Springs, Ont., June 20, 1908, (Gibson).
197. *Chrysops niger* Macq. Shelburne, N.S., July 1, 1911, (Gibson).

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198. *Chrysops vittatus* Wied. Rostrevor, Ont., Sept., 3, 1907, (Gibson).
200. *Tabanus affinis* Kirby. Weymouth, N.S., June 8, 1911, (Sanders).
203. *Tabanus epistates* O. S. Shelburne, N.S., July 1, 1911, (Gibson).
205. *Tabanus microcephalus* O. S. Shelburne, N.S., July 11, 1911; Rostrevor, Ont., Sept. 15, 1907, (Gibson).
Tabanus osborni Hine. Firth, Y. T., (Long. 141, Lat. 68-41-33), June 27-July 9, 1912; Shore of Arctic Ocean, Long. 141, (Lat. 69-40), July 27-30, 1912; Old Crow River, Y.T., Aug. 20-23, 1912, (J. M. Jessup).
207. *Tabanus septentrionalis* Loew. Youghall, N.B., July 2, 1908, (Gibson).
208. *Tabanus thoracicus* Hine. Mer Bleue, Carlsbad Springs Ont., June 1, 1903, (Gibson).
209. *Tabanus zonalis* Kirby. Shelburne, N.S., July 1, 1911, (Gibson); Aweme, Man., June, 1910, (N. Criddle).
* *Arthropeas magna* John. Beulah, Man., Can. Ent. XLV, 12.
219. *Oncodes incultus* O. S. Aweme, Man., July 5, 1911, (N. Criddle).
220. *Oncodes melampus* Loew. Long. 141, Lat. 69 to 69-20, July 12-20, 1912. (J. M. Jessup).
220. *Oncodes pallidipennis* Loew. Aweme, Man., June 15, (N. Criddle).
228. *Anthrax alternata* Say. Aweme, Man., Aug. 23, 1908, (N. Criddle).
232. *Anthrax lateralis* Say. Aweme, Man., Aug. 4, 1909, (N. Criddle).
232. *Anthrax morio* Linné. Aweme, Man., June 18, 1909, (N. Criddle).
234. *Anthrax sinuosa* Wied. Aweme, Man., July-Aug., 1909, (N. Criddle).
236. *Bombylius pygmæus* Fab. Aweme, Man., May, June, 1909, (N. Criddle).
238. *Systoechus vulgaris* Loew. Aweme, Man., July 12, 1909, (N. Criddle).
259. *Cyrtopogon dasylloides* Will. Rampart House, Y.T., Aug. 20-29, 1912, (J. M. Jessup).
262. *Holopogon seniculus* Loew. Aweme, Man., June 17, 1911, (E. Criddle).
* *Neurigona arcuata* Van Duzee. Kearney, Ont., July 3, 1909, (M. C. Van Duzee); Annals Ent. Soc. Amer. VI, March, 1913.
* *Neurigona bivittata* Van Duzee. Bear Lake, B.C., July 20, 1903, (R. P. Currie); Annals Ent. Soc. Amer. VI, March, 1913.
* *Neurigona deformis* Van Duzee. Kearney, Ont., July 8, (M. C. Van Duzee); Annals Ent. Soc. Amer. VI, March, 1913.
* *Neurigona disjuncta* Van Duzee. Toronto; Ridgeway, Ont., (M. C. Van Duzee); Annals Ent. Soc. Amer. VI, March, 1913.
* *Neurigona maculata* Van Duzee. Toronto; Kearney, Ont., (M. C. Van Duzee); Annals Ent. Soc. Amer. VI, March, 1913.
294. *Neurigona carbonifera* Loew. Rigaud, Que., June 25, 1906, (Beaulieu).
328. *Iteaphila macquarti* Zett. Rampart House, Y.T., (D. H. Nelles). A very northern record.
334. *Dorniphora concinna* Mg. Montreal, Que., June 10, 1906, (Beaulieu).
335. *Hypocera femorata* Mg. Montreal, Que., Aug. 24, 1906, (Beaulieu).
337. *Aphiochæta rufipes* Mg. Montreal, Que., April 15, 1906, (Beaulieu).
338. *Trineura aterrima* Fab. Rampart House, Y.T., Aug. 20-29, 1912, (J. M. Jessup).
Pipunculus discolor Banks. Montreal, Que., July 18, 1908, (Beaulieu).
Chilosia variabilis Panz. Firth, Y.T., (Long. 141, Lat. 68-41-33), June 27-July 9, 1912, (J. M. Jessup). Prof. J. M. Aldrich, who determined the species, states that this European insect has not heretofore been noted from the North American continent, (A. G.).

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354. *Baccha aurinota* Walk. Aweme, Man., June 16, 1911, (E. Criddle).
364. *Syrphus arcuatus* Fall. Old Crow River, Y.T., Aug. 20-23, 1912, (J. M. Jessup).
365. *Syrphus contumax* O. S. Long. 141, Lat. 69 to 69-20, July 12-20, 1912, (J. M. Jessup).
367. *Syrphus ribesii* L. Old Crow River, Y.T., Aug. 20-23, 1912, (J. M. Jessup).

Volucella bombylans L. Long. 141, Lat. 69 to 69-20, July 12, 1912, (J. M. Jessup). Prof. Aldrich, who made the determination, states that this species has not heretofore been noted from North America. He further adds: "Williston noted that *Volucella evecta* Walk. is hardly distinct from *bombylans*, and I presume it is properly to be considered only a variety." (A. G.).

388. *Eristalis pilosus* Loew. Long. 141, Lat. 69 to 69-20, July 12-20, 1912, (J. M. Jessup).
389. *Eristalis temporalis* Thoms. Rampart House, Y.T., Aug. 20-29, 1912, (J. M. Jessup).
412. *Oncomyia abbreviata* Loew. Aweme, Man., July 11, 1911, (E. Criddle).
444. *Siphona geniculata* DeG. Montreal, Que., May 20, 1906, (Beaulieu).
453. *Panzeria radicum* Fab. Long. 141, Lat. 69 to 69-20, July 12-20, 1912, (J. M. Jessup).
458. *Exorista ordinaria* Van der Wulp. Ottawa, Aug. 25, 1912, (Beaulieu).
478. *Gonia capitata* DeG. Between White Horse and Yukon Crossing, May 15-20, 1912, (J. M. Jessup).
488. *Echinomyia florum* Walk. Long. 141, Lat. 69-10, Aug. 14-7, 1912, (J. M. Jessup).
512. *Sarcophaga helicis* Town. Montreal, Que., May 20, 1906, (Beaulieu).

Ernoneura argus Zett. Shore of Arctic Ocean, Long. 141, (Lat. 69-40), July 27-30, 1912, (J. M. Jessup). Prof. Aldrich informs me that this European species has not heretofore been recorded from North America; it is an Arctic form in Europe, (A. G.).

518. *Cynomyia cadaverina* Desv. Old Crow River, Y.T., June 18-20, 1912; Long. 141, Lat. 69 to 69-20, July 12-20, (J. M. Jessup).
519. *Calliphora erythrocephala* Mg. Long. 141, Lat. 69-20, Aug. 4-8, 1912, (J. M. Jessup).
521. *Lucilia cæsar* L. Rampart House, Y.T., Aug. 20-29, 1912. (J. M. Jessup).
522. *Lucilia sericata* Mg. Rampart House, Y.T., Aug. 20-29, 1912. (J. M. Jessup).
523. *Phormia terræ-novæ* Desv. Old Crow River, Y.T., June 18-20; Rampart House, Y.T., Aug. 20-29, 1912, (J. M. Jessup).
525. *Pyrellia cyanicolor* Zett. Old Crow River, Y.T., June, 18-20, 1912, (J. M. Jessup).

* *Fannia tibialis* Malloch. Kaslo, B.C., June 9, 15, 1903, (R. P. Currie); Proc. U. S. N. M., Vol. 44, 461.

* *Fannia æthiops* Malloch. Ainsworth, B.C., (R. P. Currie); Proc. U. S. N. M., Vol. 44, 628.

Fannia incisuralis Zett. Montreal, Que., Aug. 21, 1906, (Beaulieu).

* *Paralimnophora brunnesquama* Malloch. Ottawa; Montreal; St. John, N.B., (W. McIntosh); Proc. U. S. N. M., Vol. 45, 605.

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* *Anthomyia bidentata* Malloch. Kalso, B.C., (R. P. Currie); Proc. U. S. N. M., Vol. 45, 606.

* *Trixoscelis fumipennis* Melander. Aweme, Man., June 12, 1911, (N. Criddle); Psyche, XX., 168.

575. *Limosina crassimana* Haliday. Montreal, Que., June 17, 1906; Ottawa, July 20, 1912, (Beaulieu).

575. *Limosina frontinalis* Fallen. Montreal, Que., July 7, 1906, (Beaulieu).

* *Borborus arcticus* Malloch. Fortchimo, Ungava Bay, Labrador, (L. M. Turner); Proc. U. S. N. M., Vol. 44, 367.

576. *Borborus geniculatus* Macq. Ottawa, July 20, 1912, (Beaulieu).

581. *Sepedon armipes* Loew. Aweme, Man., June-July, (E. Criddle).

586. *Sapromyza rotundicornis* Loew. Rampart House, Y.T., Aug. 20-29, 1912, (J. M. Jessup).

617. *Calobata pallipes* Say. Aweme, Man., June-July, (E. Criddle).

629. *Parydra quadrituberculata* Loew. Ottawa, July 26, 1912, (Beaulieu).

633. *Chlorops assimilis* Macq. Ottawa, July 2, 1912, (Beaulieu).

635. *Eurina exilis* Coq. Aweme, Man., June 17, 1911, (E. Criddle).

638. *Oscinis cozendix* Fitch. Montreal, Que., July 16, 1906; Ottawa, July 2, 1912, (Beaulieu).

644. *Diastata vagans* Loew. Montreal, Que., (Beaulieu).

* *Agromyza longispinosa* Malloch. Bear Lake, B.C., July 20, 1903; Kalso, B.C., July 18, 1903, (R. P. Currie); Kalso, B.C., July 7, 1903, (A. N. Caudell); Annals Ent. Soc. Amer., Vol. VI, Sept. 1913.

* *Agromyza canadensis* Malloch. Cottage Beaulieu, Montreal, Que., (not Ottawa, Can., as in Mr. Malloch's paper), Aug. 14, (Beaulieu); Annals Ent. Soc. Amer., Vol. VI, Sept. 1913.

* *Agromyza dubitata* Malloch. Montreal, Que., (not Cottage Beaulieu and Isle de Montreal, Ottawa, as in Mr. Malloch's paper), June and July, 1906, (Beaulieu); Annals Ent. Soc. Amer., Vol. VI, Sept., 1913.

647. *Agromyza æneiventris* Fallen. Ottawa, July 2, 1912; Montreal, Que., July 16, 1906, (Beaulieu).

648. *Agromyza lateralis* Will. Montreal, Que., June 3, 1906, (Beaulieu).

648. *Agromyza neptis* Loew. Montreal, Que., July 7, 1906, (Beaulieu).
Agromyza scutellata Fallen. Montreal, Que., July 7, 1906, (Beaulieu).

649. *Agromyza terminalis* Coq. Montreal, Que., Aug. 18, 1906, (Beaulieu).

649. *Desmometopa m-nigrum* Zett. Montreal, Que., July 7, 1906, (Beaulieu).

651. *Milichia indecora* Loew. Montreal, Que., July 10, 1905; Rigaud, Que., June 25, 1906, (Beaulieu).

Tethina rostrata Hendel. Prof. Aldrich informs me that this species, which was described in Wiener Entomologische Zeitung, XXX., 41, 1911, was collected by him on Pender Island, B.C., not at Pender, Idaho, as stated in the journal quoted, (A. G.).

* *Phytomyza major* Malloch. Ungava Bay, Laborador, (L. M. Turner); Proc. U. S. N. M., Vol. 46, 150.

652. *Ochtriphila polystigma* Meig. Ottawa, July 2, 1912, (Beaulieu).

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HYMENOPTERA.

During 1913, Mr. F. W. L. Sladen, of the Division of Entomology, has studied several collections of aculeate hymenoptera, from various parts of Canada. In the Ottawa district large collections have been made by Mr. Sladen, throughout the season. Many of these have been definitely determined and records are given below. We are specially grateful to Dr. S. Grænicher, of the City Museum, Milwaukee, Wis., for determining many of the Apoidea. Some, it will be seen, are not of uncommon occurrence, but little has been published regarding species occurring in eastern Ontario.

Megarhyssa greenei Vier. Preston, Ont., (H. Groh).

* *Exochilum neglectum* Morley. "Four pairs including the type were taken about Hudson's Bay, in 1844, except a single male found by Redman in Nova Scotia, about the same time"; Revision of the Ichneumonidæ, Part II, by C. Morley, (British Museum) p. 76.

* *Exochilum verticale* Morley. "Taken about 1844 in the district of Hudson's Bay, by George Barnston"; Revision of the Ichneumonidæ, Part II, by C. Morley, (British Museum), p. 78.

* *Microdus ocellanæ* Richardson. Kentville, N.S., July 28, 1912, (Sanders); Can. Ent. Vol. XLV, 212.

* *Xyela dissimilis* Rohwer. Banff, Alta., (Sanson); Proc. U. S. N. M., Vol. 45, 270.

* *Cœlinidea ferruginea* Gahan. Ottawa, July 21, 1899 (J. Fletcher); Proc. U. S. N. M., Vol. 46, 434.

Lasius brevicornis Em. Arnprior, Ont., Aug. 4, (Hewitt).

Aphænogaster fulva Rog. var. *picea* Em. Arnprior, Ont., Aug. 4, (Hewitt).

* *Formica bradleyi* Wheeler. Medicine Hat, Alta., (J. C. Bradley); Bull. Mus. Comp. Zoology, Vol. LIII, No. 10, 423.

Formica fusca L., var. *subænescens* Em. Arnprior, Ont., Aug. 4, (Hewitt).

Formica neogagates Em. Anprior, Ont., Aug. 4, (Hewitt).

Formica sanguinea Latr., sub. sp. *rubicunda* Em. Arnprior, Ont., Aug. 4, (Hewitt).

Vespa carolina Drury. Point Pelee, Ont., May 31, (P. A. Taverner).

Chlorion harrisi H. Fernald. Chatham, Ont., Aug. 24, (Sladen).

Cerceris fulvipes Cr. Ottawa, Aug., (Sladen).

Crabro aciculatus Prov. Montreal, June 22, 1906, (Beaulieu); Ottawa, July 4, (S. N. Lord).

Colletes lacustris Swenk. Ottawa, June 11 to July 7, at flowers of *Rubus*, (Sladen).

Colletes armatus Patton. Ottawa; Hull; Kazabazua, Que., Aug. 9 to Sept. 5, (Sladen).

Colletes brevicornis Robt. Aweme, Man., June 23, (Criddle).

Colletes inæqualis Say. Ottawa, April 24, 1911, (Beaulne).

Colletes gilensis Ckll. Similkameen, Okanagan, B.C., Sept. 11, 1913, (Tom Wilson).

Sphecodes ranunculi Rob. Ottawa, May, 1911, (Beaulne).

Sphecodes dichrous Sm. Ottawa, June, Aug., (Sladen).

Sphecodes prosphorus Lov. and Ckll. Ottawa, July, Aug., (Sladen).

Sphecodes nephelotus Lov. and Ckll. Ottawa, Sept., Oct., (Sladen).

Sphecodes levis Lev. and Ckll. Ottawa, Sept., Oct., (Sladen).

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* *Sphecodes hudsoni* Ckll. Hudson Bay; Can. Ent. Vol. XLV, 13.
Halictus lerouxii Lep. Ottawa, May, July, Aug., (Sladen).
Halictus coriaceus Sm. Ottawa, June, Aug., (Sladen).
Halictus truncatus Robt. Ottawa, April, Aug., (Sladen).
Halictus provancheri D. T. Ottawa, May, July, Aug., (Sladen).
Halictus pilosus Sm. Ottawa, Aug., Sept., (Sladen).
Halictus lineatulus Crawf. Ottawa, Sept., (Sladen).
Halictus zephyrus Sm. Ottawa, May, Sept., (Sladen).
Andrena vicina Sm. Ottawa, May, (Sladen).
Andrena radiatula Ckll. Ottawa, April 23, (Sladen).
Andrena cockerelli Græn. Ottawa, April, 1911, (Beaulne).
Andrena cratægi Robt. Ottawa, June 2, (Sladen).
Andrena hippotes Robt. May 28, 1911, (Beaulne).
Andrena illinoiensis Robt. Ottawa, April 21, (Sladen).
Andrena flavoclypeata Sm. Ottawa, June 23, (Sladen).
Andrena thraspii Graen. Ottawa, June 26, (Sladen).
Andrena robertsonii D. T. Ottawa, June 23, (Sladen).
Andrena nubecula Sm. Ottawa, Aug. 13, (Sladen).
Andrena nivalis Sm. Ottawa, June 18, (Sladen).
Andrena hirticincta Prov. Ottawa, Aug. 13, (Sladen).
Andrena canadensis D.T. Ottawa, Aug. 12, (Sladen).
Perdita octomaculata Say. Ottawa, Aug. 15, 1912, (Beaulne).
Calliopsis andreniformis Sm. Ottawa, June to Oct., (Sladen).
Melissodes aurigenia Cr. Thompson River, B.C., August 13, on "wild sunflower" (Tom Wilson); Ottawa, July 15 to Aug. 8, on *Rudbeckia* and *Coreopsis;* Guelph, Ont., Aug. 27, (Sladen).
Melissodes obliqua Say. Chatham, Ont., Aug. 22, (Sladen).
Melissodes cnici Robt. Ottawa, July 11 to Aug. 8, on Canada Thistle, (Sladen).
Ceratina dupla Say. Ottawa, June to Sept., (Sladen).
Xylocopa virginica Dru. St. Catharines, Ont., June 3, (G. J. Spencer).
Megachile wootoni Ckll. Ottawa, June, 1912, (Beaulne); June, July, (Sladen).
Megachile latimanus, Say. Ottawa, July, Aug., (Sladen).
Megachile pugnata Say. Ottawa, Aug. 20, 1912, (Beaulne); June-August, (Sladen).
Megachile infragilis Cr. Ottawa, June to Sept., (Sladen).
Megachile vidua Sm. Hull, Que., Aug. 31, (Hewitt); Montreal, Que., (A. Willey).
Megachile generosa Cr. Ottawa, June-Aug., (Sladen).
Megachile brevis Say. Ottawa, June-Aug., (Sladen).
Cœlioxys ribis Ckll. Ottawa, July, (Sladen).
Cœlioxys alternata Say. Ottawa, July, (Sladen).
Cœlioxys lucrosa Cr. Ottawa, June 14, (Sladen); Montreal, Que., (A. Willey).
Cœlioxys octodentata Say. Ottawa, June 27, (Sladen).
Cœlioxys rufitarsus Sm. Ottawa, July-Oct., (Sladen).
Osmia atriventris Cr. Ottawa, April 25 to June 5, (Sladen).
Osmia canadensis Cr. Ottawa, May 4 to June 5, (Sladen).
Heriades carinatus Cr. Ottawa, June 28 to July 31, (Sladen).

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* *Heriades leavitti* Craw. Nerepis, N.B., Aug. 22, (Leavitt); Can. Ent. Vol. XLV, 270.

* *Anthidium wallisi* Ckll. Peachland, B C., Aug. 9, 1909, (Wallis); Can. Ent. Vol. XLV, 14.

Alcidamea simplex Cr. Ottawa, June 3 to July 13, (Sladen).

Andronicus cylindricus Cr. Ottawa, June 5 to Aug. 4, (Sladen).

Clisodon terminalis Cr. Ottawa, June 6 to Aug. 18, (Sladen).

Anthophora bomboides Kirby. Ottawa, June 28; Kazabazua, Que., July, (Sladen).

Bombus morrisoni Cr. Ashcroft, B.C., (Rev. W. M. Roger).

Bombus terrestris, var. *moderatus* Cr. Rampart, Y.T., (D. H. Nelles).

Bombus separatus Cr. Aweme, Man., June 1, (Gibson); Ottawa, June 12; Chatham, Harrisburg, Guelph, Ont., Aug. 27, (Sladen).

Bombus bimaculatus Cr. Grimsby, Ont., Aug. 29, (Sladen).

* *Bombus bolsteri* Franklin. Bay of Islands, Little River, Humber River, near Deer Lake, Newfoundland, (P. G. Bolster); Trans. Amer. Ent. Soc. Vol. XXXVIII, 357.

Psithyrus insularis Sm. Ottawa, June 4-18, (Sladen), only record we have from Ontario.

Hemiptera.

A small number only of insects of this order have been received during the year, and as far as we know no systematic collections have been made in any part of Canada. Small lots of specimens collected in other years have been determined, and of these, records of the following seem worthy of inclusion here.

Scolops sulcipes Say. Winnipeg, Man., Aug. 8, 1908, (Hanham); Covey Hill, Que., Sept. 10, 1912, (Petch).

Heliria scalaris Fairm. Laval Co., Que., (Beaulieu).

Ophiderma salamandra Fairm. Chelsea, Que., July 3, 1909, (Gibson).

Elidiptera variegata Van D. Ottawa, Nov. 4, 1902, (J. Fletcher).

Macropsis nigricanus V. Duz. Rudy, Sask., July 19, 1907, (J. Fletcher).

Oncopsis variabilis Fitch. La Sienne River, District of Rainy River, Ont., July, 1890, (W. McInnis).

Halticus apterus Linn. Bondville, Que., July 28-Aug. 2, (Moore).

Lygus convexicollis Reut. Bondville, Que., July 28-Aug. 2, (Moore).

Phytocoris eximius Reut. Bondville, Que., July 28-Aug. 2, (Moore).

Phytocoris tibialis Reut. Bondville, Que., July 28-Aug. 2, (Moore).

Mimoceps insignis Uhler. Bondville, Que., July 28-Aug. 2, (Moore).

* *Aradus funestus* Bergoth. "Canada . . . Northern U. S., from the Atlantic to the Pacific Ocean"; Can. Ent. Vol. XLV, 4.

Corizus nigrosternum Sign. Bondville, Que., July 28-Aug. 2, (Moore).

Corizus novæ-boracensis Sign. Bondville, Que., July 28-Aug. 2, (Moore).

Alydus quinquespinosus Say. Winnipeg, Man., Aug. 16, 1900, (Hanham).

Brochymena quadripustulata Fabr. Covey Hill, Que., July 27, 1912, (Petch).

Ælia americana Dall. Winnipeg, Man., June, 1900.

Mormydea lugens Fab. Arnprior, Ont., Aug. 4, (Hewitt).

Podisus cynicus Say. Covey Hill, Que., July 29, (Petch).

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Neuropteroid Insects (Except Odonata).

(Arranged according to a catalogue of the Neuropteroid Insects (except Odonata) of the United States, by Nathan Banks; American Entomological Society, 1907. The numbers refer to the pages of the catalogue).

Isoptera.

6. *Termopsis angusticollis* Hag. Departure Bay, Vanc. Is., B.C., July 6, (Walker).

Archiptera.

10. *Pteronarcys californica* Newp. Edmonton, Alta, (F. S. Carr).
13. *Isoperla bilineata* Say. Go-Home Bay, Ont., May 29, 1912, (Clemens).
* *Ephemerella bicolor* Clemens. Go-Home Bay, Ont., July 1-12, (Clemens); Can. Ent., Vol. XLV, 336.
* *Ephemerella lineata* Clemens. Go-Home Bay, Ont., June 14, 15, (Clemens); Can. Ent., Vol. XLV, 336.
* *Ephemerella lutulenta* Clemens. Go-Home Bay, Ont., May 29-June 19, (Clemens; Shawanaga Bay; Penticost Island; French River and Sturgeon Bay, Ont., (R. P. Wodehouse); Can. Ent. Vol. XLV, 335.
* *Siphlurus flexus* Clemens. Go-Home Bay, Ont., May 23-June 12, (Clemens); Can. Ent., Vol. XLV, 338.
* *Heptagenia lutea* Clemens. Go-Home Bay, Ont., emerged June 27-July 3, (Clemens); Can. Ent., Vol. XLV, 254.
* *Heptagenia rubromaculata* Clemens. Go-Home Bay, Ont., emerged June 22-July 29, (Clemens); Can. Ent. Vol. XLV, 258.
* *Heptagenia fusca* Clemens. Go-Home Bay, Ont., emerged June 23, 24, (Clemens); Can. Ent., Vol. XLV, 254.
* *Ecdyurus lucidipennis* Clemens. Go-Home Bay, Ont., emerged July 4 and 17, (Clemens); Can. Ent. Vol. XLV, 329.
* *Ecdyurus pullus* Clemens. Go-Home Bay, Ont., June 27-July 2, (Clemens); Can Ent. Vol. XLV, 330.

Neuroptera.

22. *Raphidia assimilis* Albarda. Departure Bay, Vanc. Is., July-Aug. (Walker).
22. *Raphidia oblita* Hag. Departure Bay, Vanc. Is., Aug. 8, (Walker).
23. *Climacia areolaris* Hag. Go-Home Bay, July 31, 1912, (Walker).
24. *Polystoechotes punctatus* Fab. Departure Bay, Vanc. Is., B.C., Aug. 5, (Walker).
24. *Hemerobius pacificus* Banks. Departure Bay, Vanc. Is., B.C., Aug. 13, (Walker).
27. *Chrysopa assimilis* Banks. Okanagan Landing, B.C., Aug. 17, (Walker).
27. *Chrysopa chi* Fitch. Nipigon, Ont., June 19, (Walker).
27. *Chrysopa chlorophana* Burm. Departure Bay, Vanc. Is., B.C., July 6, (Walker).
27. *Chrysopa coloradensis* Banks. Departure Bay, Vanc. Is., B.C., July 17, (Walker).
27. *Chrysopa majuscula* Banks. Departure Bay, Vanc. Is., B.C., Aug. 3, (Walker).

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28. *Chrysopa ypsilon* Fitch. Nipigon, Ont., June 18; Dauphin, Man., June 22; Prince Albert, Sask., June 23; Departure Bay, Vanc. Is., B.C., (Walker).
30. *Myrmeleon immaculatum* DeG. Departure Bay, Vanc. Is., July 25-Aug. 5, (Walker).

TRICHOPTERA.

(Determined by Dr. Nathan Banks.)

35. *Neuronia concatenata* Walk. Gray Island, Georgian Bay, Ont., June 27, 1912, (Walker); Lonely Lake, Vanc. Is., B.C., July 18, (Walker).
35. *Agrypnetes curvata* Banks. Nipigon, Aug. 6, 1910, (Walker); Banff, Alta., June 29, (Walker).
36. *Glyphotaelius hostilis* Hagen. Nipigon, Aug. 6, 1910, (Walker).
36. *Limnephilus combinatus* Walk. Lonely Lake, Vanc. Is., B.C., July 18, (Walker).
39. *Platyphylax lepida* Hag. Go-Home Bay, Sept. 7, 1912, (Walker).
39. *Parachiona parvula* Banks. Banff, Alta., June 29, (Walker).
41. *Apatania tripunctata* Banks. Sulphur Mt., Banff, Alta., June 28, (Walker).
41. *Chimarrha aterrima* Hag. Muskoka Mills, Georgian Bay, Ont., June 30, 1912, (Walker).
43. *Helicopsyche borealis* Hag. Go-Home Bay, July 31, Aug. 1, 1912, (Walker).
45. *Molanna uniophylla* Vorhies. Go-Home Bay, July 2-Sept. 3, 1912. (Walker).
45. *Leptocerus angustus* Banks. Go-Home Bay, Aug. 8, 1912 (Walker).
45. *Leptocerus recurvatus* Banks. Go-Home Bay, Aug. 12, 1912, (Walker).
45. *Triænodes flavescens* Banks. Go-Home Bay, Aug. 29, 1912, (Walker).
46. *Leptocella uwarowi* Kolen. De Grassi Pt., Ont., July 1, 1912, (Walker).
46. *Œcetina avara* Banks. Go-Home Bay, July 31-Aug. 22, 1912, (Walker).
46. *Œcetina fumosa* Banks. Go-Home Bay, Aug. 12, 1912, (Walker).
46. *Œcetina immobilis* Banks. Go-Home Bay, Aug. 1-Sept. 4, 1912, (Walker).
46. *Œcetina incerta* Walk. Go-Home Bay, July 31-Sept. 3, 1912, (Walker).
46. *Mystacides sepulchralis* Walk. Go-Home Bay, Aug. 2-12, 1912, (Walker).
47. *Hydropsyche alternans* Walk. Go-Home Bay, Aug. 20, 1912, (Walker).
47. *Hydropsyche chlorotica* Hag. Go-Home Bay, Sept. 4, 1912, (Walker).
47. *Hydropsyche slossonæ* Banks. Go-Home Bay, June 7, 1912, (Walker).

ODONATA.

Lestes congener Hag. Departure Bay, Vanc. Is., B.C., July 19-Aug 10, Okanagan Landing, B.C., Aug 16, (Walker).

Lestes uncatus Hag. Prince Albert, Sask., June 23; Departure Bay, B.C., June 23-July 30, (Walker).

Nehalennia irene Hagen. Dauphin, Man., June 22; Prince Albert, Sask., June 24, (Walker).

Ischnura cervula Selys. Banff, Alta, June 29, (Walker). New to Alberta list.

Enallagma ebrium Hagen. Dauphin, Man., June 23, (Walker).

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Coenagrion resolutum Selys. Prince Albert, Sask., June 24; Banff, Alta, June 29, (Walker).

Coenagrion angulatum E. Walk. Prince Albert, Sask., June 24, (Walker).

Ophiogomphus severus Hag. Prince Albert, Sask., June 26, (Walker).

Aeshna caerulea septentrionalis Burm. Banff, Alta., June 29, (Walker). New to Alberta list.

Aeshna sitchensis Hag. Banff, Alta., June 29, (Walker).

Aeshna interrupta interrupta E. Walk. Departure Bay, Vanc. Is., July 31-Aug. 12 (Walker).

Aeshna eremita Scudd. Prince Albert, Sask., July 26; Departure Bay, Vanc. Is., July 31, Aug. 10, (Walker).

Aeshna canadensis E. Walk. Prince Albert, Sask., July 26; Departure Bay, Vanc. Is., Aug. 10, 13, (Walker). New to Saskatchewan list.

Aeshna tuberculifera E. Walk. Departure Bay, B.C., Aug 10, 13, (Walker), First record west of Wisconsin.

Aeshna umbrosa E. Walk. Hughes Station, Ont., (near Cochrane), Sept. 24 (W. S. Odell). Most northerly Ontario record.

Somatochlora walshii Scudd. Dauphin, Man., June 23, (Walker). New to Manitoba list.

Somatochlora minor Calv. Prince Albert, Sask., June 26, (Walker). New to Saskatchewan list.

Dorocordulia libera Selys. Fort William, Ont., June 20, (Walker). Most northerly record.

Cordulia shurtleffi Scudd. Departure Bay, Vanc. Is., July 19, (Walker).

Sympetrum madidum Hag. Prince Albert, June 23: Departure Bay, Vanc. Is., July 30, (Walker).

Sympetrum obtrusum Hagen. Okanagan Landing, B.C., Aug. 16 (Walker). These specimens are identical with eastern *obtrusum*.

Leucorrhinia hudsonica Selys. Prince Albert, Sask., June 26 (Walker). New to Saskatchewan list.

Leucorrhinia glacialis Hagen. Prince Albert, Sask., June 26; Departure Bay, B.C., July 19, (Walker). New to Saskatchewan and B. C. lists.

Leucorrhinia proxima Calv. Departure Bay, July 19, (Walker).

Leucorrhinia borealis Hag. Dauphin, Man., June 23; Prince Albert, Sask., June 25, (Walker).

Leucorrhinia intacta Hagen. Prince Albert, (Sask.), June 25, (Walker). Most northerly record and new to Saskatchewan list.

THYSANURA.

Isotoma nigra MacG. Arnprior, Ont., on snow, Dec. 25, (C. Macnamara). Determined by Dr. Folsom.

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